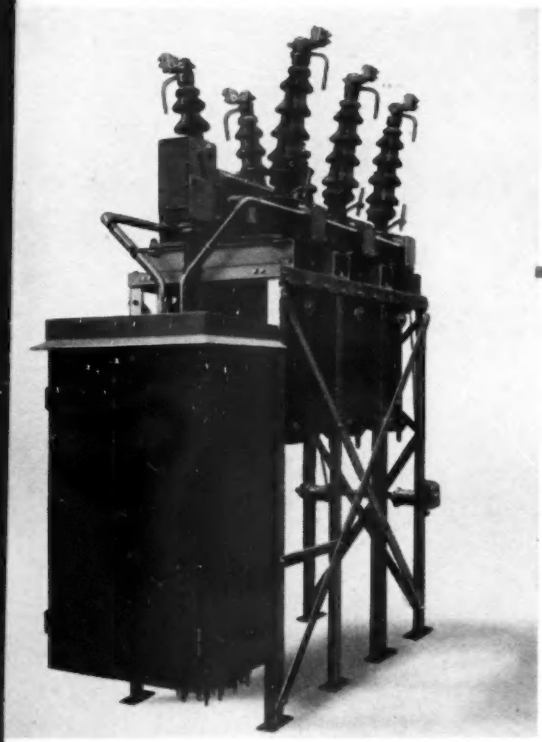
ELECTRICAL TIMES

THURSDAY
17 DEC.
1953
NINEPENCE



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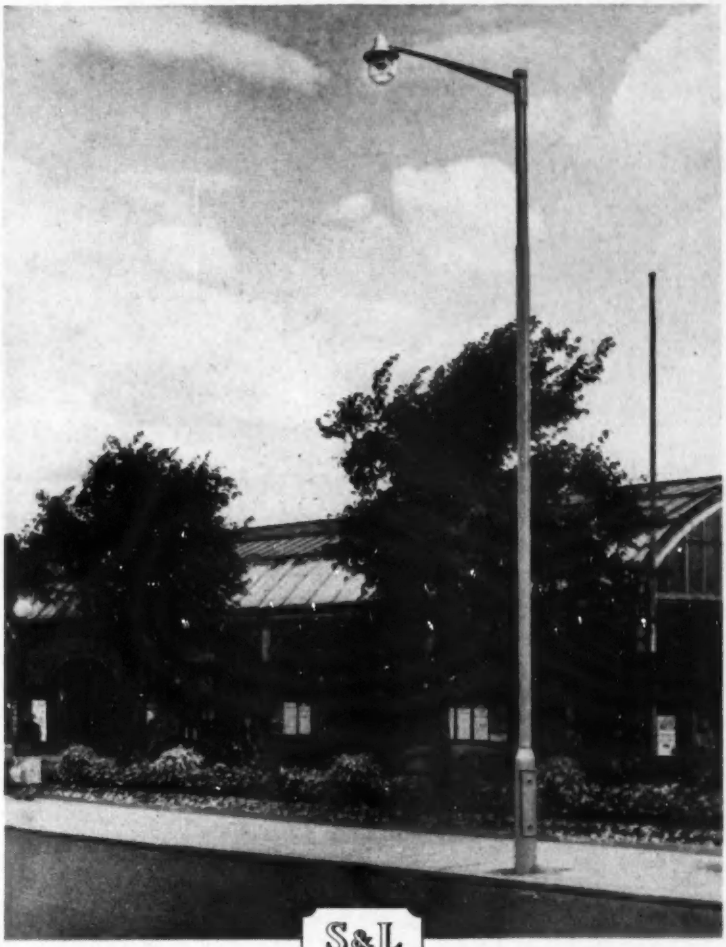

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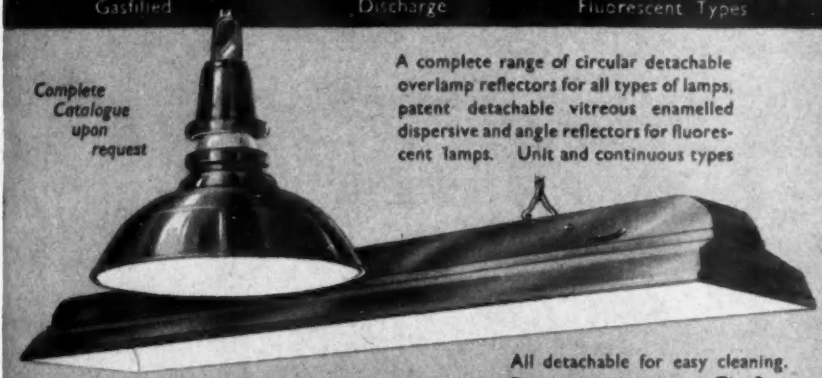

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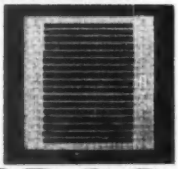

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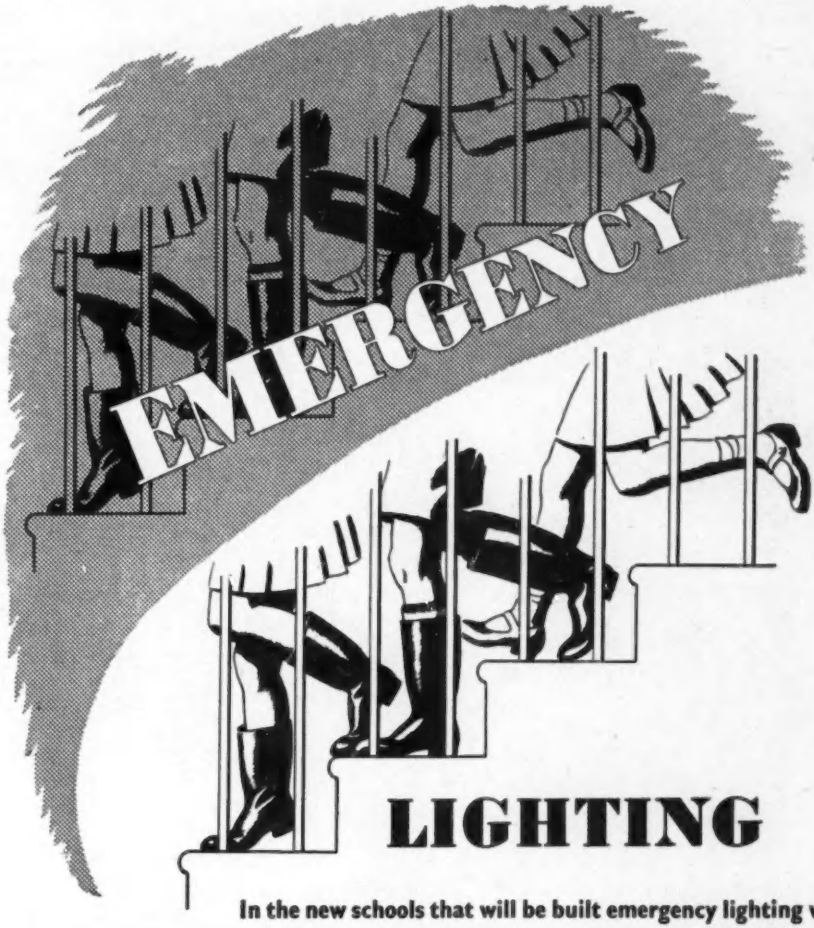

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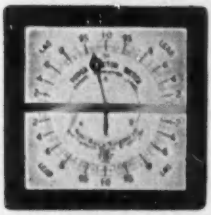

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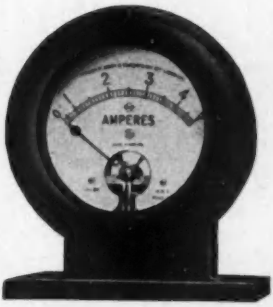

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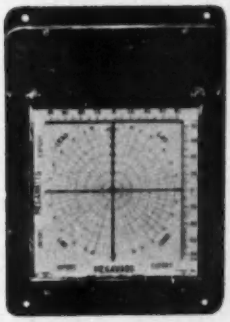

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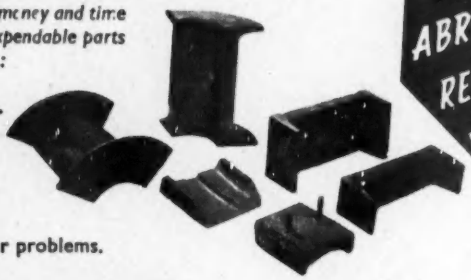

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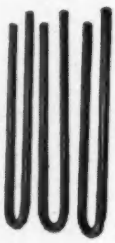

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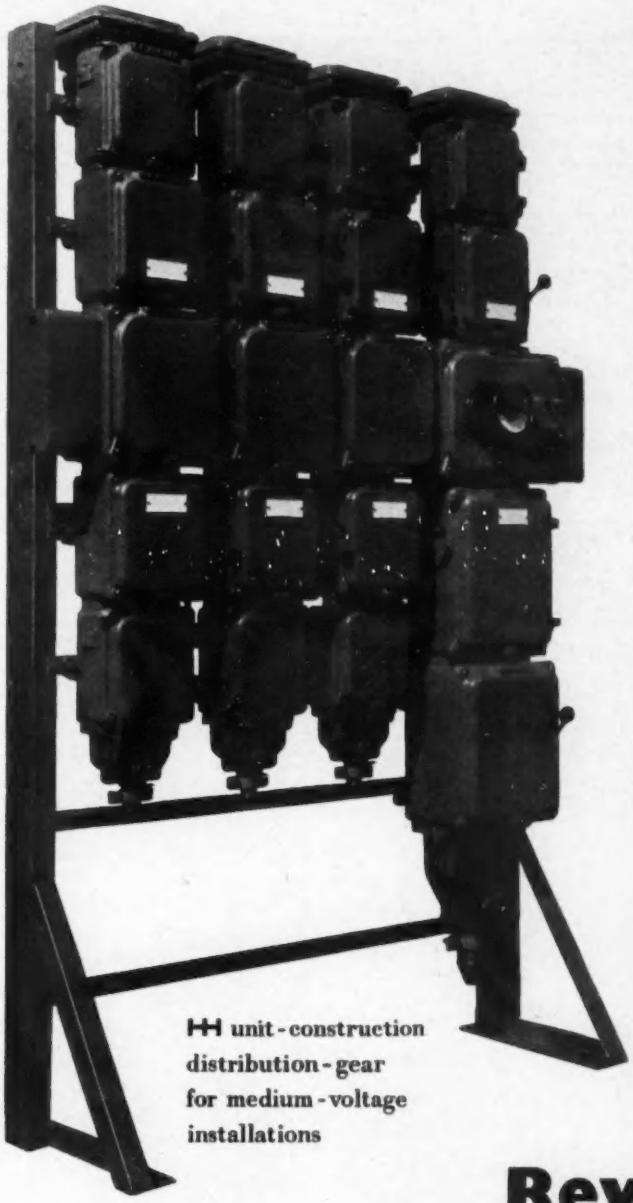

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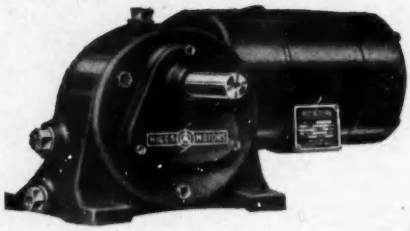

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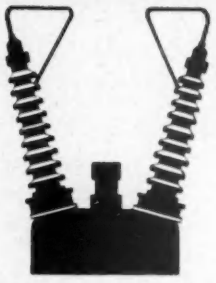

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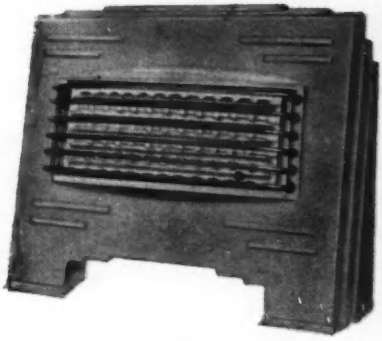

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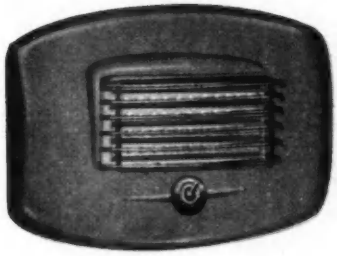

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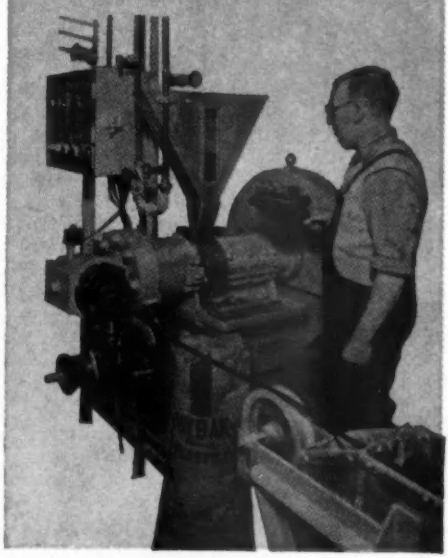

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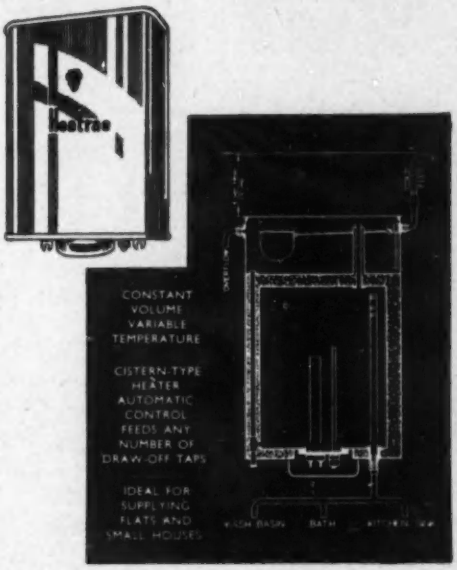
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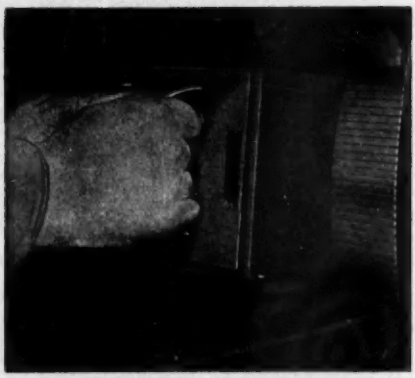

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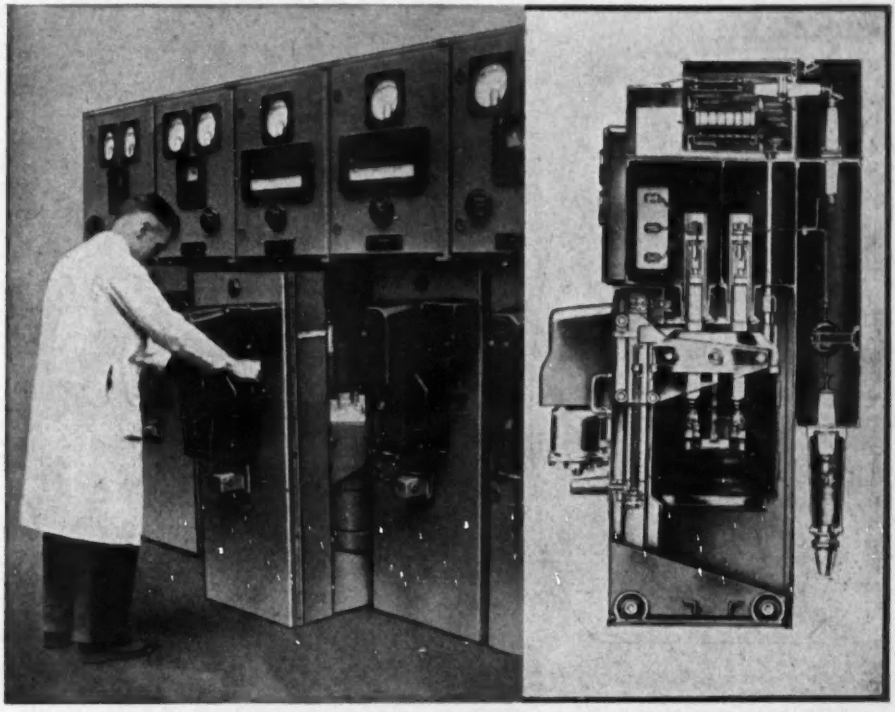

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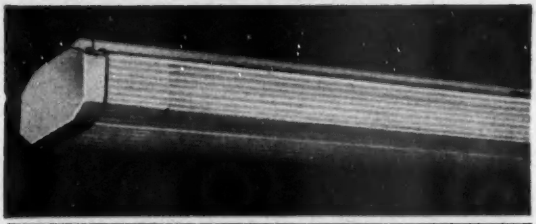

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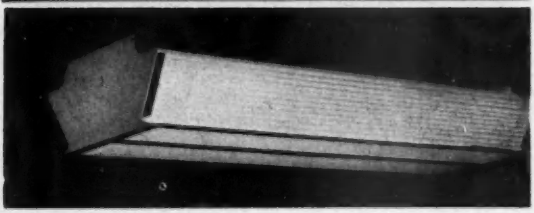

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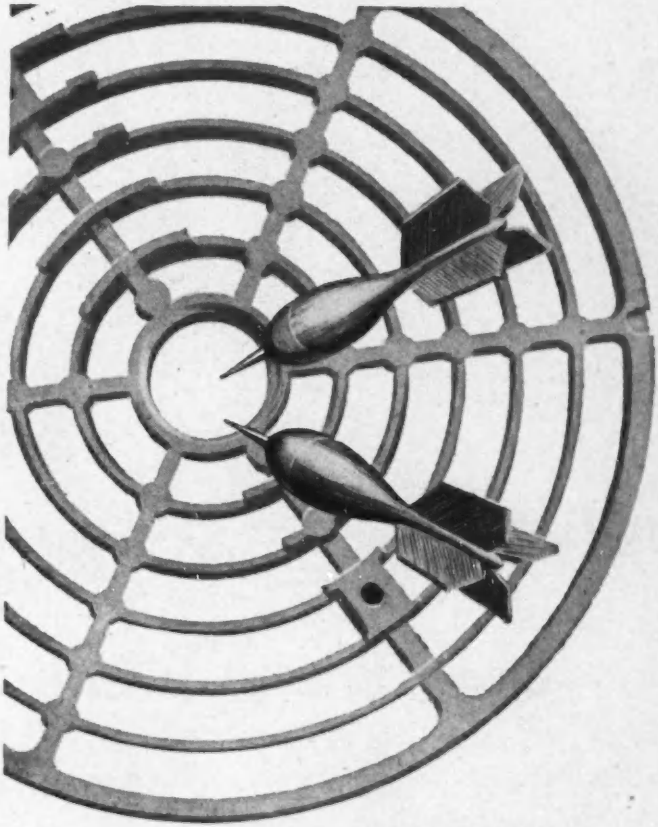

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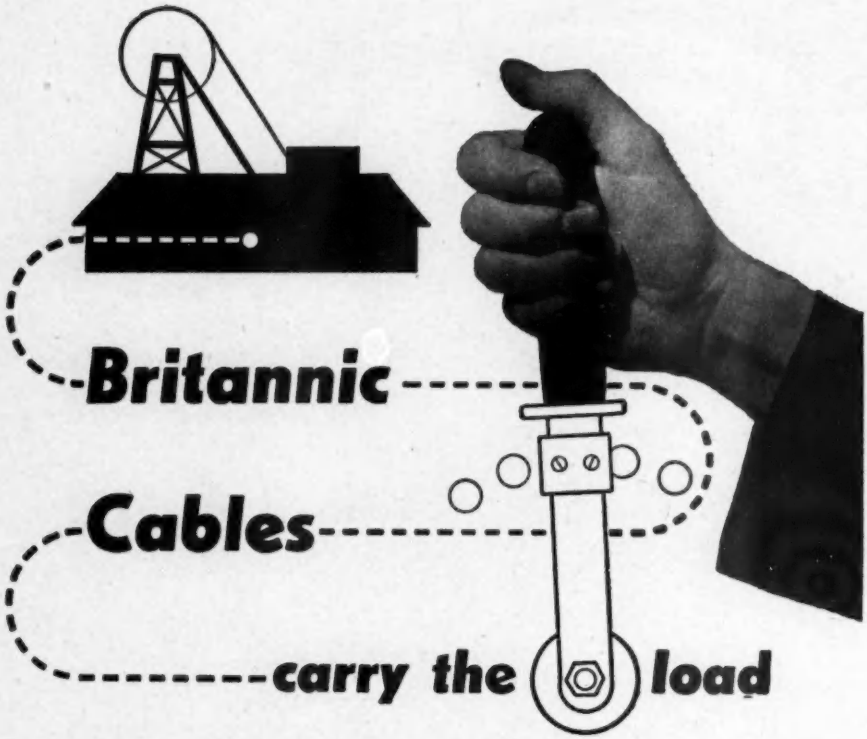

Power, light, life itself in the mine depend upon cables that can withstand wet, heat and gruelling wear. Britannic Cables are conscientiously made with this in mind, and all over the world they are confirming the good name of their makers . . . Product of an independent company, they are priced to meet any competition.

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THE "SATCHWELL" TYPE V THERMOSTAT FOR ELECTRIC WATER HEATERS IS AN INSTRUMENT OF QUALITY

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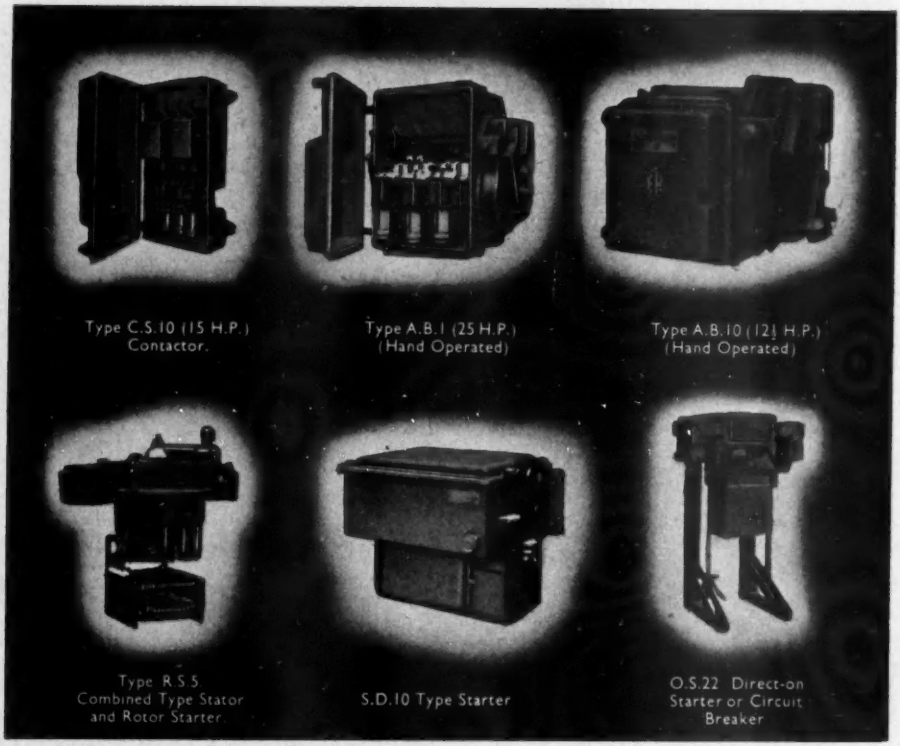
Motor Control Gear

¼ H.P. up to 5,000 H.P.


Type C.S.10 (15 H.P.) Contactor.
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Type R.S.5 Combined Type Stator and Rotor Starter
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Above are illustrated a few different designs of star delta, direct-on and stator and rotor type motor starters, and throughout their full range great care has been taken in the designs to combat the rough usage they are subjected to by heavy duty. We cater for controlling practically every type of machine that is made in the manually-operated airbreak and oil immersed types.

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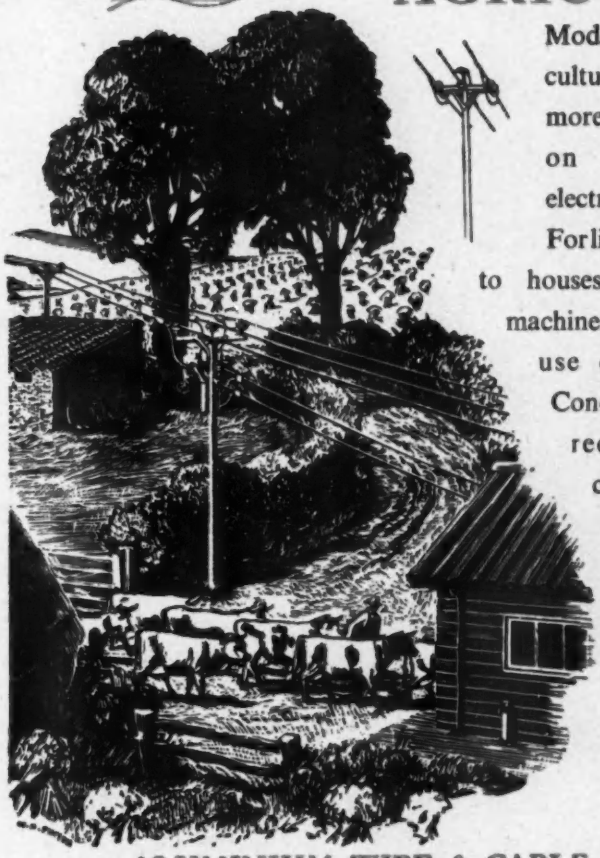
647 (A)

The *Power*ful Link for AGRICULTURE



Modern methods in agriculture make the farmer more and more dependent on readily available electricity.

For light and power supplies to houses, out-buildings and machinery installations, the use of All-Aluminium Conductors can greatly reduce electrification costs.

Agriculture depends on electricity; electricity depends on Aluminium.

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ALUMINIUM WIRE & CABLE CO. LTD.

Britain's Largest Manufacturers of Aluminium Wire and Conductors

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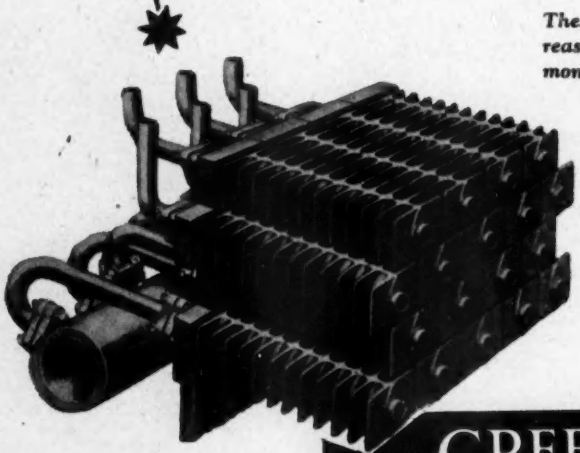
A greater field of vision . . .

The arrangement of the heating surfaces in Green's Premier Diamond Economisers enables *every* portion to be adequately inspected—there are no dead spaces. The joints, too, are arranged for complete accessibility.



Premier Diamond Steel Tube Economiser—suitable for the highest working pressures.

These are but two of the reasons why Premier Diamond Steel Tube Economisers show maximum availability in practice. Note, too, the extended and compact heating surface of the cast-iron sleeves surrounding the steel tubes. Also in all-welded construction.

GREEN'S ECONOMISER

E. GREEN & SON LTD · WAKEFIELD

Makers of economisers for more than one hundred years

GE103

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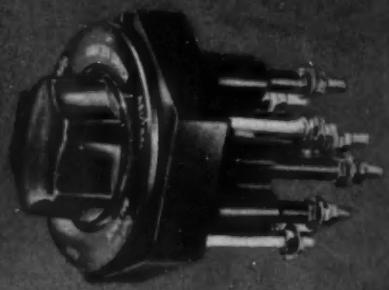

Attractive in appearance. Smooth and positive operation. Insulating shrouds afford ample protection when mounted on steel panels. Competitive in price.

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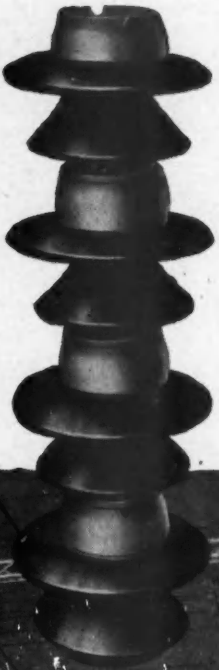

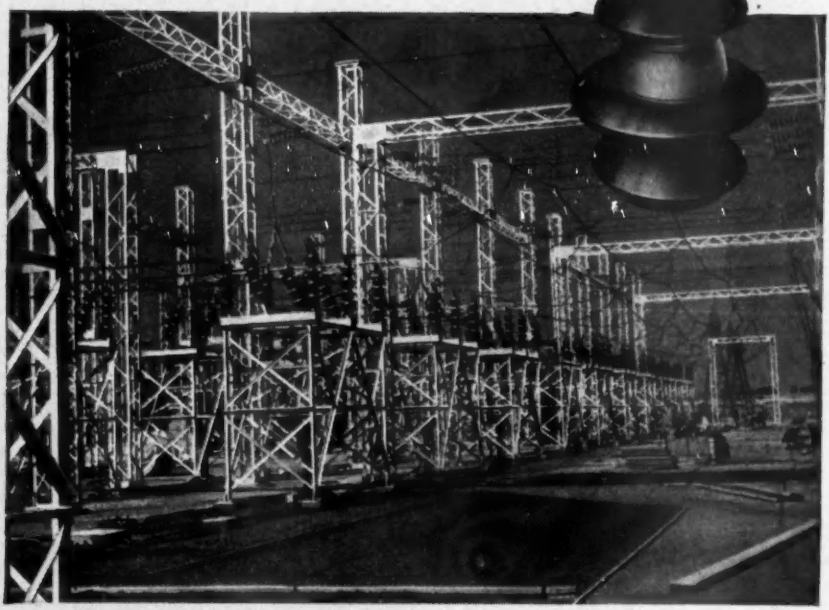

Photograph by courtesy of the B.T.H. Company (South Africa) (Pty.) Limited

The 88 kV. Switchyard at Vierfontein Power Station of the Electricity Supply Commission (Rand Undertaking) is one of many for this Authority insulated with S.P.P. Posts of 4-units P.642.

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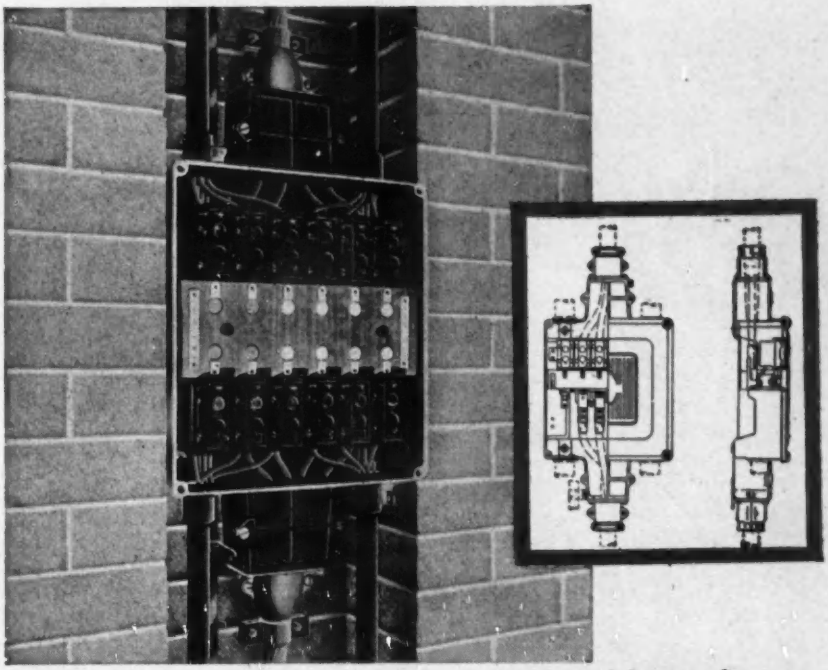

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BICC Rising Main Boxes are made in cast iron and are designed for speedy installation. They fit into a chase of standard brickwork dimension (13½" x 4½") and are an economical form of distributing up tc twelve single-phase or four three-phase circuits from a four-core rising main.

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DO YOU KNOW

of a ceiling switch comparable with the **TEMCO** *at such a reasonable price?*

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Each Switch is suitable for mounting on a wood block or iron box and can be operated from ceiling or wall. Available in 1 and 2 way brown on white, all brown or all white. Accessory Catalogue available on request.

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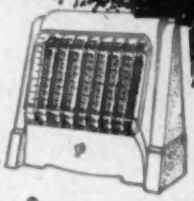

you Warmest

Wishes for a

Hearty Christmas,

with all your

problems

Ironed out

and everything under

Control for

a Bright

and a Breezy

New Year

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Over 2,000,000 in the United Kingdom and Eire

Already there are over two million "ARMOURLIGHT" Toughened Glass insulators in use in the United Kingdom and Eire; nearly a million in Australasia; more than a million in Africa; and hundreds of thousands in Europe and elsewhere.

Their high electrical and mechanical strength, their ability to withstand puncture by lightning surges, and the fact that fault-finding can be done by quick visual inspection from ground level, or from the air, makes them an obvious choice for large powerline installations.

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Water heater thermostat

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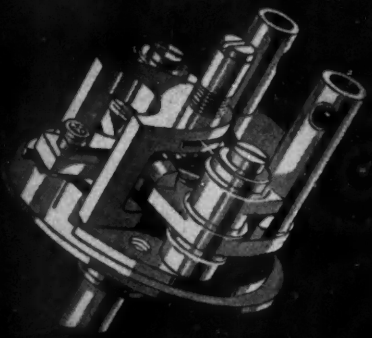

An all-in-one-piece electrical circuit (instead of innumerable screw contacts) — a positive action, Simmerstat-type switch — sooner or later these are going to make a difference to your maintenance costs . . . .

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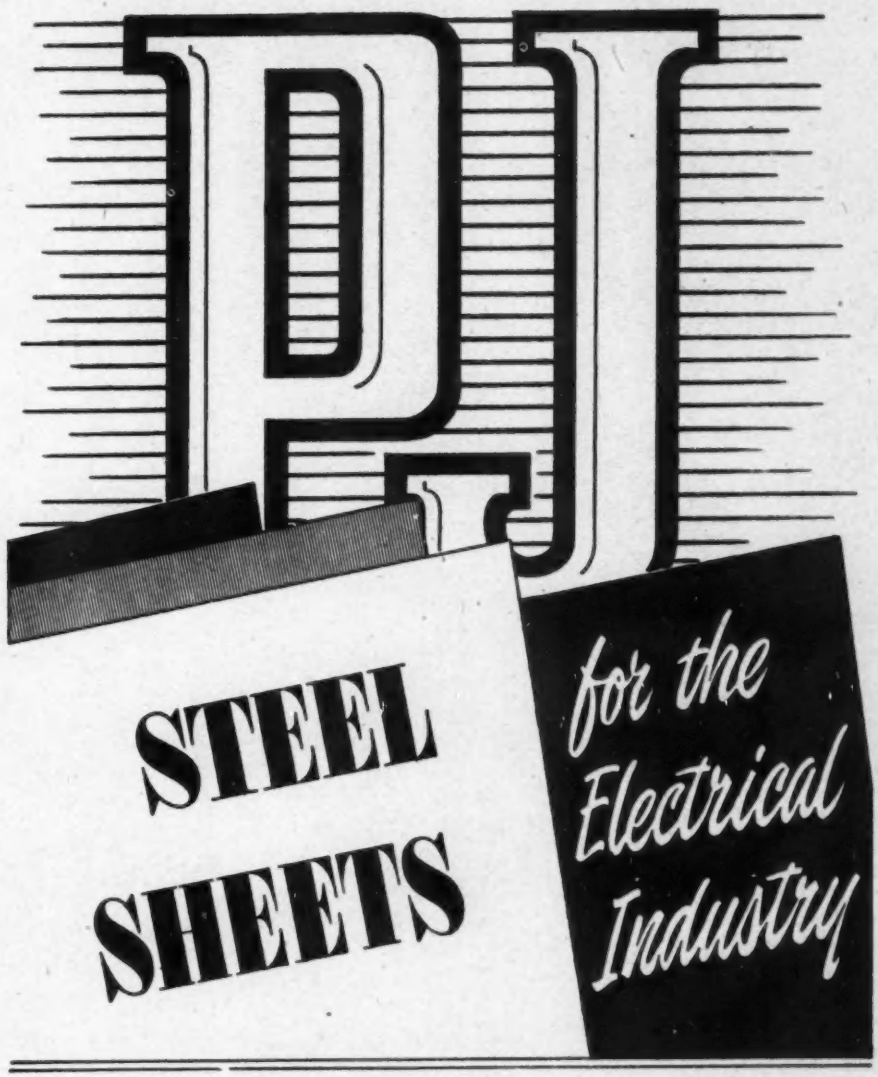

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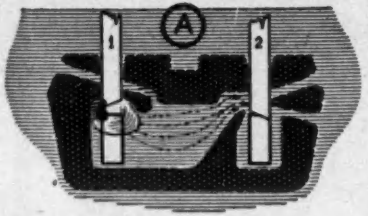
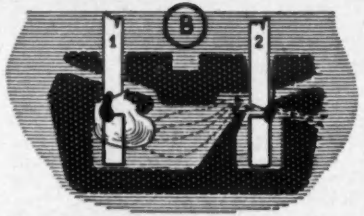
THE "CATON" ARC TRAPPED CIRCUIT BREAKER

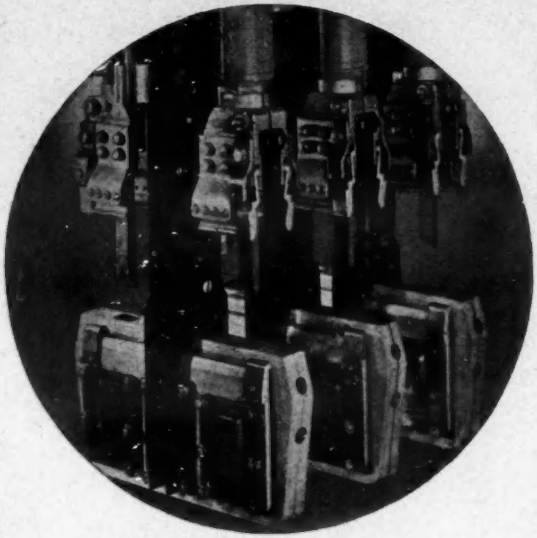
IN SERVICE AND FULL PRODUCTION FROM 250 MVA, 6.6 kV TO 500 MVA, 22 kV



No. 1. Electrode leads by $\frac{1}{4}$ cycle. Pressure trapped except for constricted relief at No. 2 in advance of Arc.

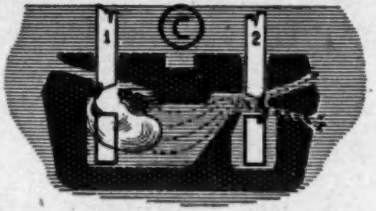


No. 2. Electrode breaks contact. Arcing restricted and displaced by pressure.

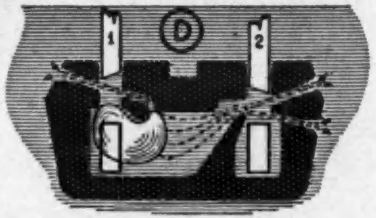


Equal response at all currents.

A revolution in circuit breaking technique.



Arc severed at current zero by high pressure clean oil.



Arc trap device scoured by exhausting pressure and rapidly refilled with clean oil.

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Two hundred and four solid filaments of alkali-free glass go to form the yarn from which Fibreglass electrical insulating materials are produced. Because they are made to operate with equal efficiency under conditions of overload, heat, damp, dust or corrosive fumes more and more makers and users of electrical equipment are specifying Fibreglass-insulated wire, tapes, sleevings and tying cords. Fibreglass alone embodies all the desirable features of—

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INORGANIC STRUCTURE
RESISTANCE TO MOST ACIDS, OILS AND CHEMICAL FUMES
NO MOISTURE ABSORPTION
EXCELLENT THERMAL CONDUCTIVITY
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It's *more* than 204 to 1 against failure with Fibreglass.

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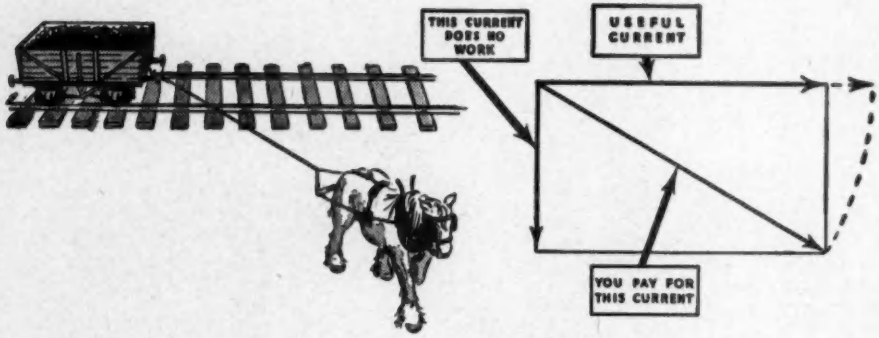

Wattless current does no useful work!

Much industrial electrical plant still operates at an unduly low "power-factor," and users are penalised for this undesirable condition in their electricity charges.

The "power-factor" of an industrial works load can be improved to any desirable value by installing Ferranti Power Factor Correction Capacitors, and the capital cost can be recovered in savings in cost of electrical energy, usually within one year.

Industrialists and other users concerned by rising electricity costs can profitably investigate this method of increasing the "earning capacity" of the electric energy consumed—Ferranti engineers will give advice and prepare schemes showing the substantial savings which are possible.

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Power Factor Correction

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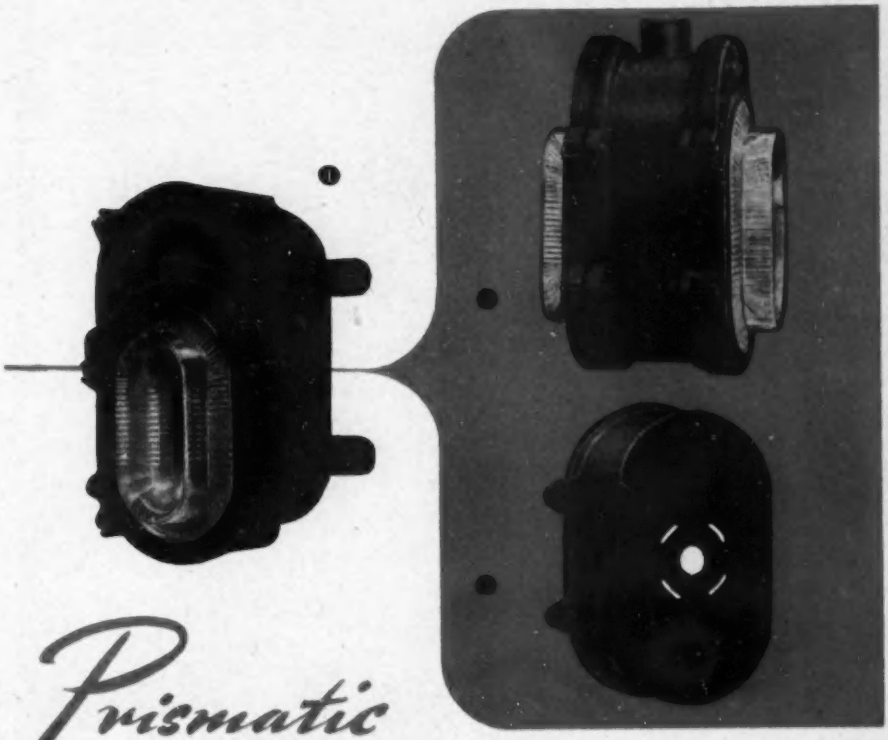

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FOR TUNGSTEN FILAMENT LAMPS UP TO 150W

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1. *Cat. No.* 330. *Through type with Rubber Packing Joints for* 100/150 *watt lamps.*
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3. *Prismatic fittings are also made for B.S.I. box attachment in sizes up to* 150 *watts.*

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HEYES & COMPANY LTD., WATER HEYES ELECTRICAL WORKS, WIGAN

dm HC71

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The "Mutac" A.C. switch is now a universal best seller, designed with its enclosed contacts to give the highest mechanical and electrical efficiency, ensuring the best possible service.

The S6001 Surface Ironclad Unit with protected dolly cover illustrated is but one of the wide range of "Mutac" accessories now available, all of which are highly competitive.

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BASED ON FACT!

THE meter element and prepayment mechanism have been long established and are well known for their reliability. A simple rate change mechanism is incorporated in the meter which enables the rate to be changed in a moment on site without special tools and in order to eliminate the possibility of mistakes the rate is charged in "price per unit" steps, with a clear indication of the operating price. Money in credit is immediately charged at the new rate.

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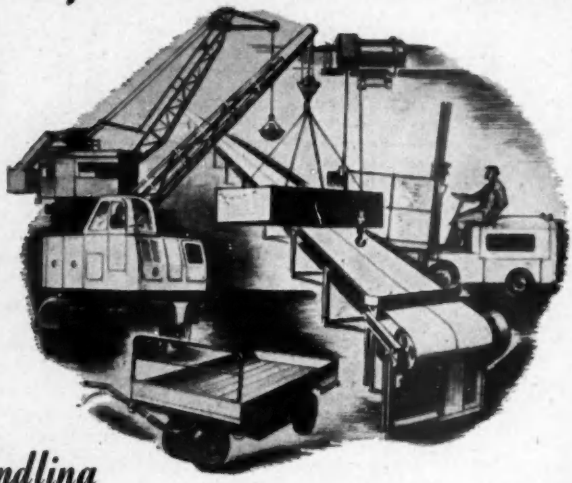
Wheels of industry the world over are turned

by

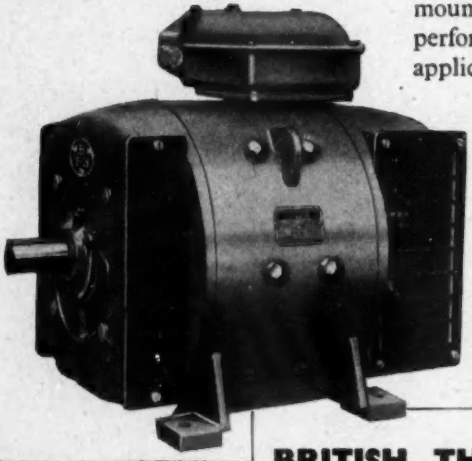
B
T-H

ELECTRIC MOTORS



in mechanical handling

Whenever a power drive is needed, there is a BTH motor that will do the job efficiently and economically. In industries all over the world, BTH motors are helping to increase production. Over half-a-century's experience of this branch of electrical engineering enables BTH to offer the motor with the mounting, enclosure, rating, and performance best suited to the application.



BTH factories are exceptionally well equipped to make both ***STANDARD*** *and* ***SPECIAL*** *machines in large quantities.*

Member of the AEI group of companies

THE
BRITISH THOMSON-HOUSTON
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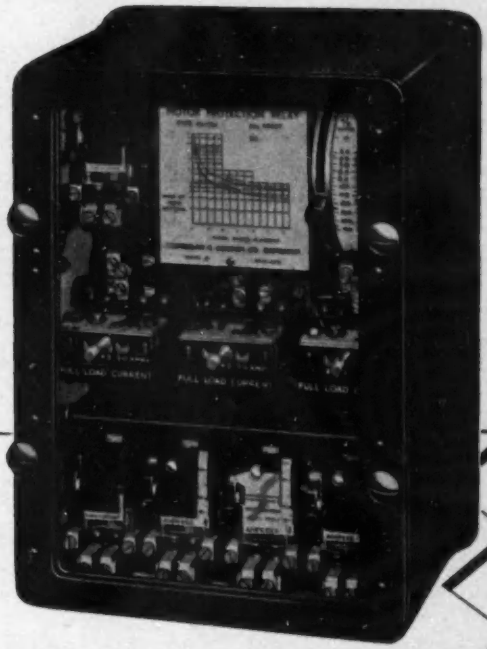
MOTOR PROTECTION THERMAL RELAY

TYPES H, HST, HST/AM



(*illustrated*)
TYPE HST/AM

The essential feature found in these protective devices is that they remain inoperative on starting surges yet protect induction motors against prolonged overloads—of vital importance where maintenance of continuous service is necessary. Full details of these relays are available on request.

APPLICATIONS.

Type H relays are designed to protect three-phase star or delta-connected induction motors against overload or single-phasing conditions, where the starting current does not exceed 7 times normal.

Type HST relays offer similar protection to larger motors having starting currents in excess of 7 times full load and which are likely to be prolonged because of high inertia loads.

Type HST/AM relays offer additional instantaneous protection against short-circuit faults.

Chamberlain and Hookham

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It's all a matter of
research and good design
translated into practice.
The anisotropic alloy used in
the magnets of our commercial
grade meters has high coercivity
and an almost flat recoil line,
permitting large magnet gap and
maximum freedom from external
interference. That's good technique.
However, you're concerned with results.
Repeat orders from all over the world for
our electricity meters prove that in practice
they're all you want them to be and that

meters are matters for

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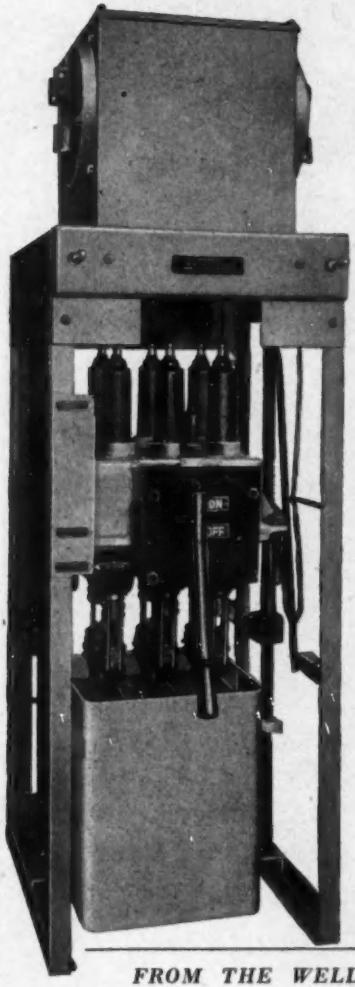
RBP

AN OIL-SWITCH YOU CAN



ISOLATE

without interrupting supply in ring main units

DESIGNED...

... to enable complete isolation of the switch for ease of inspection and maintenance (with no interruption of supply in ring main units)

... to make and carry fault currents up to 250 MVA at 6.6 kV (also tested to B.S. 116/1937)

... so that electro-magnetic forces assist the closure of the switch under through-fault or short-circuit conditions (it cannot possibly be forced open)

... for mounting on a simple framework (yet having a full complement of interlocks)

... for maximum voltage of 11 kV and maximum current rating of 600 amperes (it has liberal clearances yet small dimensions)

FROM THE WELL KNOWN TRINAL RANGE *OF INTERCHANGEABLE SWITCHGEAR*

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CHARLTON • LONDON • S.E.7

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LEWMEX

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is the best

WINDING WIRE

Its outstanding characteristics

- Safe working temperature (continuous operation) of 110° C
- Extreme flexibility
- Resistance to oil and varnish solvents
- Outstanding physical and mechanical properties

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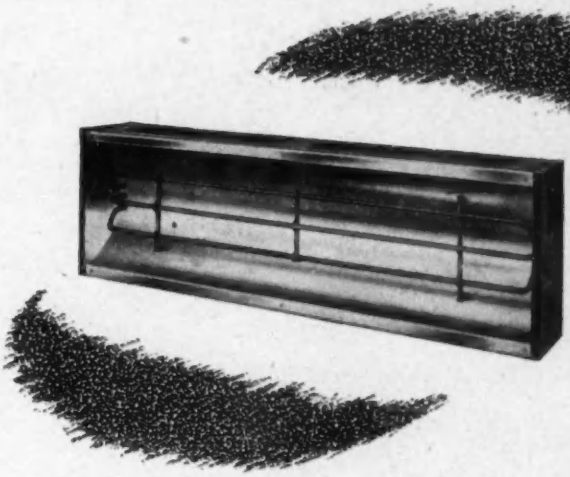
No element of doubt . . .



. . . with Metrovick Elements

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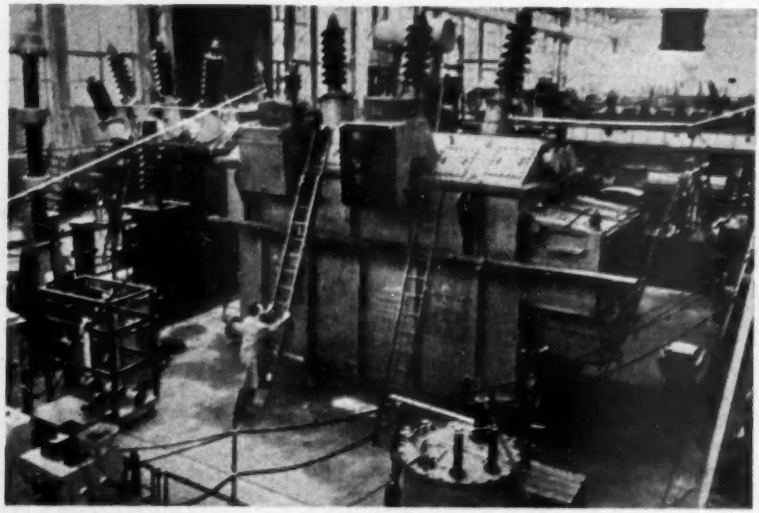

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ELECTRICAL TIMES

Volume 124 No. 3241 17 DECEMBER, 1953

PUBLISHED EVERY THURSDAY

POWER FOR THE "GEORGE CROSS" ISLAND ... 1127

OUR READERS' VIEWS 1131

POWER IN THE EAST 1132

EXPERIMENT IN STREET LIGHTING 1135

NOTES ON WIRING, by Megohm 1138

FAULT-LEVEL CALCULATION, by J. G. Boggis, A.M.I.E.E., G.I.Mech.E. 1139

COPPER-MANGANESE-TIN ALLOYS 1142

THE FUTURE OF POWER IN BRITAIN 1143

LIFTS FOR COUNCIL FLATS 1145

B.E.A.'S NEW DEPUTY CHAIRMAN 1147

AIR-BREAK CIRCUIT-BREAKERS 1148

PROBLEMS AND PRACTICE IN ENGINEERING ... 1149

OVERSEAS NEWS 1150

PERSONALITIES IN THE INDUSTRY 1152

THE BUYER'S COLUMN 1154

THE WEEK IN NEWS 1156

Questions in Parliament... 1160

Electric Supply News 1162

Company Activities 1163

COMMERCIAL INFORMATION 1164

CLASSIFIED ADVERTISEMENTS 57

INDEX TO ADVERTISERS... 66

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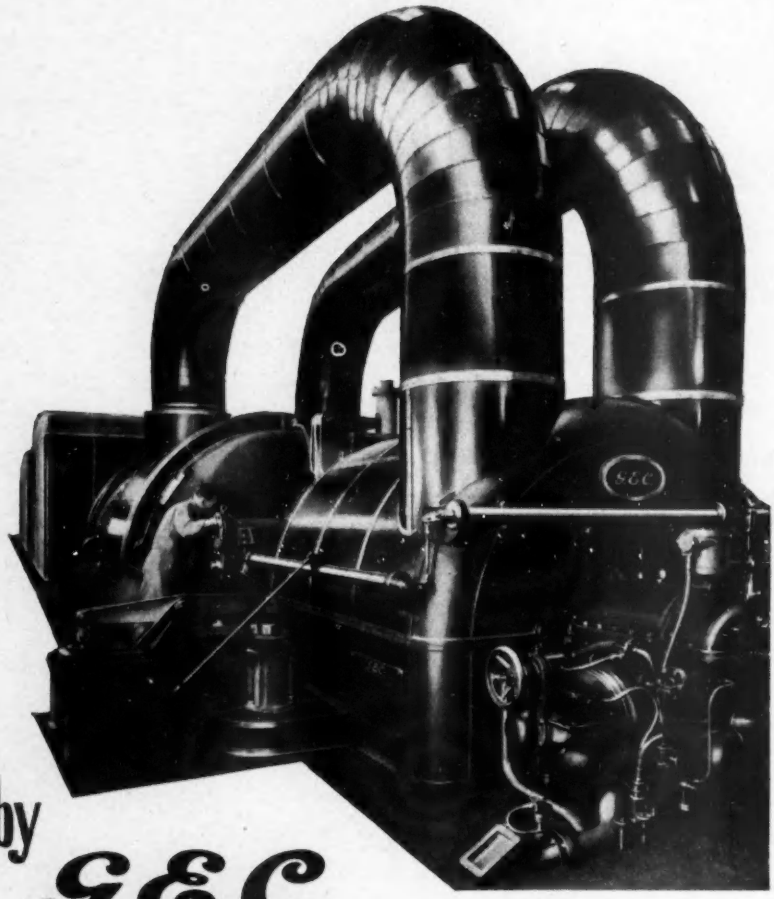


by G.E.C.

The 60,000 kW hydrogen-cooled turbo-alternators recently installed at Uskmouth Power Station, Newport, Mon., are achieving the highest efficiency ever known for power generators of this size operating at a steam pressure of 900 lb. per sq. in. and at a steam temperature of 900° F.

The heat consumption figure at full output officially confirmed by the British Electricity Authority is 9,027 B.Th.U. per kWh.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Editorial

THE NEW DEPUTY

ALL will feel regret at the departure of Sir John Hacking from the position of deputy chairman. In the past five years not only has he had to build up a new national technical organisation, he has had to steer the industry through the most difficult time of plant shortage. His successor, Mr. Eccles, to whom we offer our congratulations, was one of the committee prior to vesting day which established the organisation, over the whole of which he will now exercise authority. His appointment to headquarters may effect some change in balance of outlook since he will bring to the triumvirate an internal knowledge of the problems of area boards which we hope will be manifest in a more energetic approach to electricity sales. At this time, when electricity supply is breaking free from the shackles of insufficient plant, new problems are arising, and in meeting these we wish every success to the new deputy chairman.

SIZEABLE SETS

THE ultimate refinements of thermal efficiency in a steam turbine are inevitably associated with high temperatures and pressures and large sizes. There is, indeed, good reason to welcome size alone, because of its effective economy in capital cost, but when this characteristic is combined with advanced steam conditions it is doubly acceptable. It must, therefore, have given Sir John Hacking considerable pleasure to be able to announce in almost his last address while Deputy Chairman of the B.E.A., that the Authority is contemplating the installation of a set of 180 or 200 MW rating, working at 2,700 lb/sq in., the limiting pressure for a drum type boiler. This is an attractively ambitious move, and it appears, moreover, that it is being taken without a departure from the decision to use a unit-boiler-generator system. Since this will involve the building of a single boiler rated at about 1·5 million pounds of steam per hour, it represents a major technical achievement on the part of British boiler makers. At one time, it appeared that the complete adoption of the unit-turbine-boiler principle might limit set ratings to 120 MW because of the difficulty of producing a furnace that would burn high ash-content British coals at a sufficient rate to raise steam for an output above this. That this has not, in fact, proved to be the case, is another important point in favour of the decision to use unit boilers.

RIGHT OF WAY IN

AT one time it seemed the complexities of Parliamentary procedure might block the Bill which a group of M.P.s have introduced to regulate the right of electricity and gas board personnel to enter private premises. However, these difficulties have now been resolved, and there now seems a hope that this simple measure may become law almost by absence of objection. The statutory power to enter consumers' premises in certain circumstances is a reasonable provision of various gas and electricity Acts, but there can be little doubt that the present climate of public opinion is against continuing for the nationalised boards even this qualified right. There is instead a strong preference for putting the electricity board official on the same basis as the policeman, and requiring him to obtain a warrant from a Justice of the Peace before he assumes the right to walk into a house supported by legal sanctions applicable to anyone who obstructs him. If this restriction were imposed, a form of action would be removed which acts as a considerable irritant to the public, and undermines goodwill. Electricity boards, at least, should welcome the right to apply for a

warrant, and we hope that the way of the Bill through the House will continue to be smooth, and that it may eventually find its way on to the Statute Book.

POWER IN THE EAST

DEVELOPING industrialisation in the countries of the Eastern hemisphere must involve considerable electrification. At present for most of such countries public electricity supply is a matter for a medium-sized hydro scheme here, a steam or diesel generating station there, each with its local distribution system attached. Judging by past experience in the West, however, increasingly intensive use of the available natural resources of power will lead inevitably to the development of an integrated power system, with water power and thermal stations interlinked by long transmission lines. If this future expansion is to escape inhibition by earlier decisions, planning for the smaller schemes being installed today must have the ultimate power picture in mind. It is the admirable purpose of the United Nations Economic Commission for Asia and the Far East to ensure that this shall be so, and from the notes on another page, it should be apparent that a practical approach to the problem is being adopted.

FUEL SCARCITY

ONE of the problems afflicting most of the countries in the E.C.A.F.E. region is a shortage of fuel for thermal stations. Preliminary surveys suggest the imperative need for attention to be given to the possibility of burning lignites, of which there are reasonable supplies in many places. Here again, European experience is providing a valuable basis for development of ways of tackling the technical problems involved, which are bound to be considerable. Mr. Eisenhower's speech last week, however, does seem to offer a possibility that another solution may present itself by the time Eastern industrialisation has advanced to the position of needing large power supplies. If plutonium does indeed become available in large amounts at an early date for peaceful uses, then the world-wide development of nuclear power stations is likely to be greatly accelerated. The nations of the East might benefit considerably from such a changed situation since, although the high cost and the technical complexity of nuclear installations will make it difficult for small countries to afford them, their modest requirements of fuel in terms of mass may at least make their operation an economic possibility where a shortage of indigenous fuel rules out alternative methods of generation.

The ELECTRICAL TIMES *will be restyled throughout in quarto format from the first issue in January next*

UPLIFT

SOCIOLOGY may be a study most excellent in this welfare state of ours, but even its most ardent devotees would hardly go so far as to recommend it as a possible answer to the problems of electrical interlocking. Yet such is the suggestion of Mr. C. G. L. Morley in his recent paper on electric lifts. Certainly nowhere is the complexity of interlocks greater than in passenger lift design, and nowhere are so many safety requirements needed than in a block of council lifts. The task is no easy one, for there is no simple electrical circuit to safeguard against such practices as sticking matches in press buttons, nor does the finest complex of interlocks prohibit children from queuing for that great attraction, free rides. The relationship between sociology and lifts in council flat life appears to stem from such factors as these, and with 80 per cent of the cost of repairs attributable to misuse and malicious damage, the need is clear. Mr. Morley's paper is as excellent an account of the ingenuity of the electrical engineer as it is an indictment of human behaviour under tempting circumstances.

Meteor

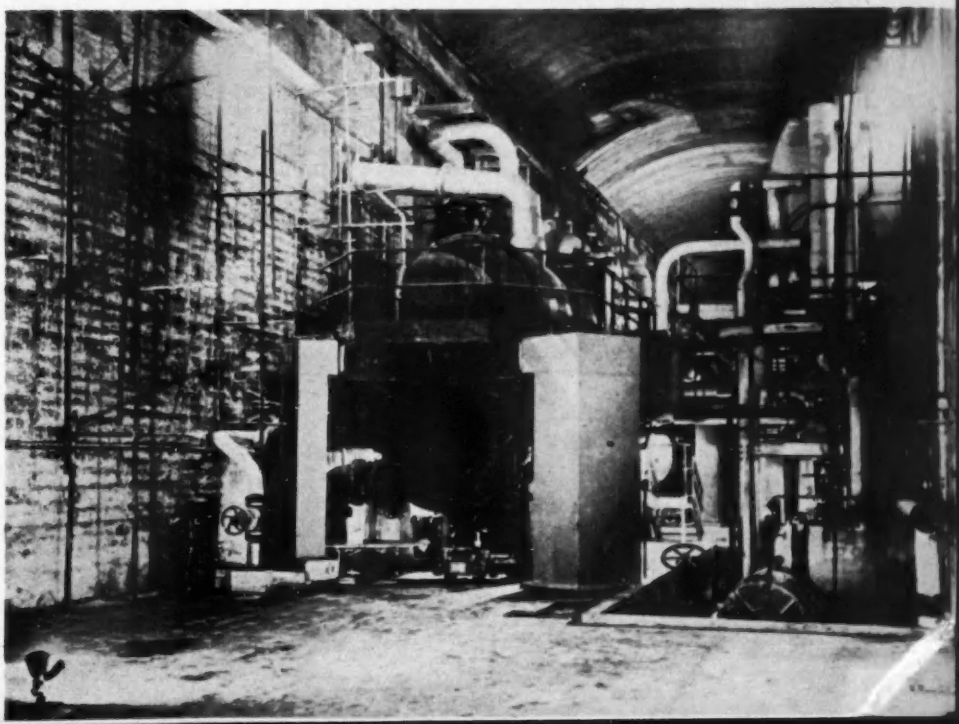
Power for the "George Cross" Island

JESUIT'S HILL, MALTA, A SUBTERRANEAN STEAM STATION IS NOW OPERATING

THE opening of Malta Power Station, on Saturday, December 5th, by His Excellency the Governor and Commander in Chief, Sir Gerald Hallen Creasy, marked the inauguration of what is possibly a unique example of engineering—for the Malta station is an entirely underground steam plant. Even prior to the war plans had already been made for the installation in Malta of a new power station, and conversion of the out-dated power distribution network to a standard 50 c/s 3-phase system. These, however, were not fulfilled, due to the outbreak of hostilities, and when peace returned the situation was becoming critical. Application was accordingly made by the Government of Malta for assistance from E.C.A. funds in the reconstruction of the Island's system. This was in 1949, and at that time it was found that the necessary equipment could not readily be obtained from European countries participating in Marshall Aid. As a result, it was found possible to establish a case for a grant of some $2,320,000 from the Overseas Development Pool of the E.C.A. for the purchase of American plant and equipment for a new station to be built underground at Jesuit's Hill, Malta.

This hill had already been tunnelled and was, during the war, used as a store depot for Naval equipment. The existing work consisted effectively of three parallel tunnels connected with transverse passages in the centre and at both ends, with exit tunnels leading to the exterior running off diagonally from the corners of the triple tunnel system.

No. 1 Turbine Set. This photograph was taken while the sets were being erected



E.H.T. switchgear in one of the tunnels

Plant Installed

The plant provided under the E.C.A. system comprises three 5 MW Westinghouse "packaged" turbo-alternator units complete with Foster-Wheeler oil-fired boilers. Each boiler unit is designed to produce 70 klb/hr of steam at conditions of 430 lb/sq in. at 760°F. The turbines are rated at 6,250 kW at unity p.f. The boilers themselves are installed in one of the tunnels, two vertical shafts having been driven through the hill to provide an exit for the flue gases. An unusual design feature is that the boilers have no economiser, although superheaters and air heaters are fitted. Fully automatic combustion control equipment is, however, provided, and in other respects the units are comparatively normal. For fuel a heavy grade residual oil is used, and although emergency tank heating is provided, the ambient temperature is generally sufficiently high in view of the comparatively short pipe runs, to permit tracer lines in the pipe system to be dispensed with.

The turbines are of the impulse, multi-stage single cylinder type running at 3,000 r.p.m. Steam is extracted at three points in the expansion, two for feedwater heating and deaerating and the third supplying duplicate evaporators. The turbine rotor is supported by two bearings and the alternator by one, there being a solid flange coupling between the two rotors. A main oil pump driven by the turbine is provided together with an automatic start steam driven auxiliary pump. Duplicate full-duty oil coolers are provided together with a continuous by-pass filter unit of 80 g.p.h. capacity.

A direct driven exciter is fitted to each alternator and is air-cooled, but the alternator itself is provided with a closed air system fitted with a water-cooled air cooler in two sections.

The condensers are designed to give 28 in. Hg vacuum at 5,000 kW with a cooling water inlet temperature of 80° F, and 27·66 in. Hg at a load of 6,250 kW under the same inlet water conditions. Each condenser contains 6,000 sq feet of cooling surface and requires 5,930 gallons per minute of circulating water.

Cooling water is circulated through each condenser by a single horizontal motor-driven pump of capacity 6,300 gallons per minute at a total head of 61 ft. The driving motor is rated at 125 b.h.p. Priming is effected by a single steam-jet air ejector in each case.

Condensate is extracted from each condenser by a vertical motor-driven extraction pump of a maximum capacity of 77,000 lb per hour which represents a duty of approximately 25% above the normal full load steam consumption of the turbine. These pumps are provided in duplicate.

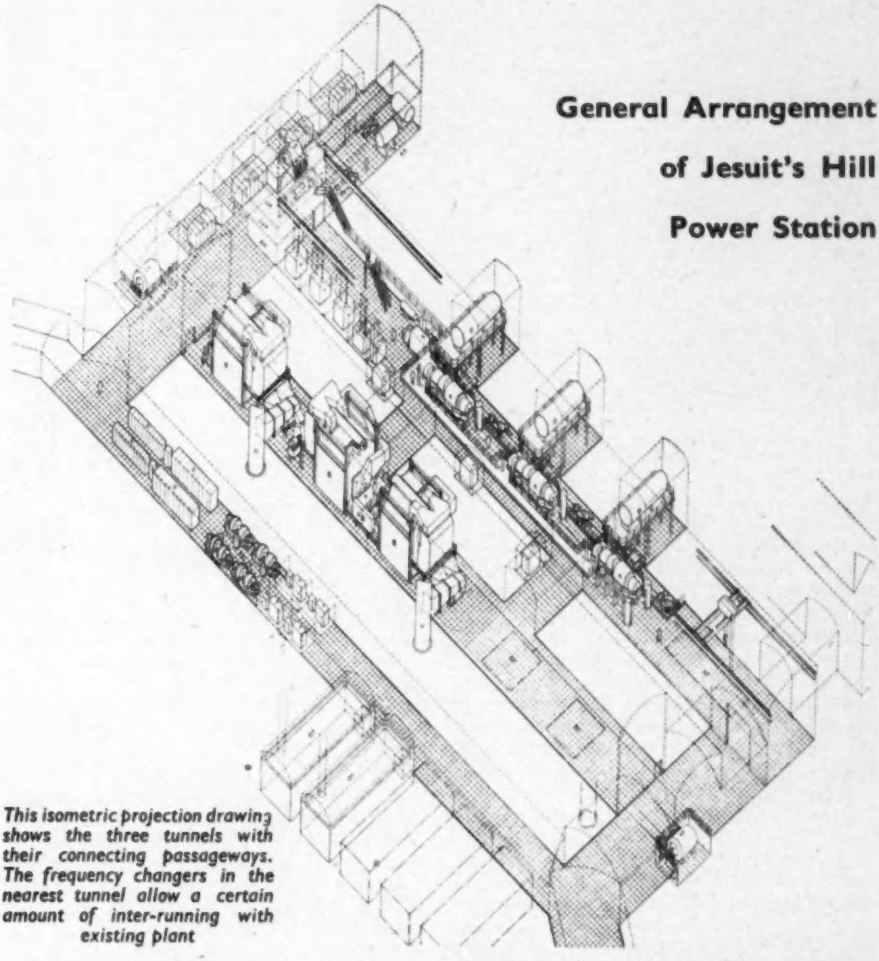
Condensate System

Condensate leaving the extraction pump passes first to the air ejector condensers and thence to the low pressure feed water heater, finally discharging into a combined deaerating feed water heater which also acts as a surge tank, having a storage capacity, when full, equal to 20 minutes at full load.

High and low water gong alarms are provided to give audible warning to the operator and for starting purposes an operating supply of saturated steam is available direct from the boiler. Each evaporator has a working capacity of 2,050 lb/hr. and the vapour produced from the raw water together with the condensate from the feed water heater which, as previously mentioned, is fed with steam normally extracted from the turbine, is returned to the deaerator.

Duplicate boiler feed pumps are provided for each unit each with a capacity of 81,000

General Arrangement of Jesuit's Hill Power Station



This isometric projection drawing shows the three tunnels with their connecting passageways. The frequency changers in the nearest tunnel allow a certain amount of inter-running with existing plant

lb/hr against a total head of 1,300 ft, one being steam turbine driven and the other driven by an electric motor. The steam pump turbine exhaust may be returned to the deaerator or passed directly to atmosphere.

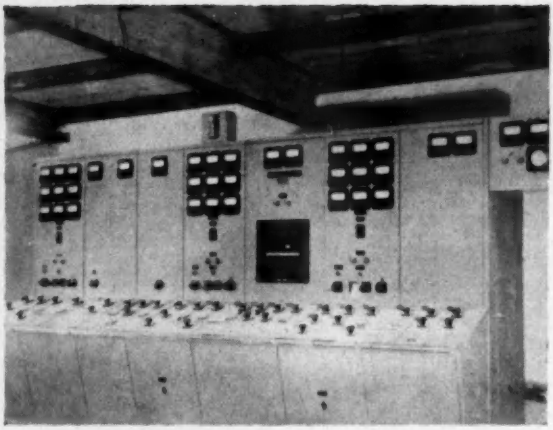
If required, condensate may be bled off at the entry to each deaerator to an additional condensate surge tank and water may be returned from this tank to any deaerator by means of duplicate condensate transfer pumps. These pumps are also used to supply cold filling facilities to the boilers.

It is therefore possible to transfer condensate from one unit to another and thus the feed pump system can be regarded as common and interchangeable to a large extent, which is not possible with the self-contained units.

The feed pump discharges from each unit are coupled into a common header and in consequence it is possible to run with any boiler and pump combination. The steam discharge mains from each boiler are also coupled into a common header from which each turbine and the various auxiliary supplies are fed.

Circulating Water System

Circulating water is obtained from two inlet chambers fitted with travelling trash screens which are situated on the water front in positions approximately opposite the ends of the turbine gallery. The two inlet cham-



A view of part of the control room showing operating metering panels

bers are connected by culverts cut from the rock which leads inwards to the underside of the turbine gallery and then traverse this longitudinally to meet in the middle. Provision is made for the fitting of dam boards in suitable positions so that parts of the system can be isolated with the minimum of interference with the operation of the station.

A single outlet is provided for the circulating water which also traverses longitudinally the underside of the turbine gallery and then passes at an incline to an outfall point in the harbour at the opposite side of the promontory formed by Jesuit's Hill. The inlet and outlet works are thus some distances apart and the danger of circulating water being recirculated is minimised.

In order to obviate the trouble which has been experienced on the old station due to marine growths in the circulating water culverts chlorine injection equipment is provided for the circulating water system of the new station.

Fuel Oil Storage

Schemes for the bulk storage of fuel oil by the Government in its own tanks were investigated, but have not yet been authorised on account of the high initial cost. Thus the station for the present will rely on regular deliveries of oil to a barge berth adjacent to the c.w. outlet. Fuel is delivered by the tanker barge pumps through a welded steel pipeline to either of the two existing 350-ton service tanks. These are concrete lined excavations in the rock, and the storage provided is sufficient for some 12 days operation at full load.

Ventilation

The ventilating system as a whole is designed to deal with a total heat dissipation rate in boiler house and turbine room combined of 3,800,000 B.Th.U/hour. The total fan capacity is over a quarter of a million cubic feet per minute. Under the design conditions the maximum average temperature in the galleries should not exceed that of the outside air by more than about 15° F.

Ventilation in the turbine gallery is provided by a fan which draws air from a side access gallery and forces this into the turbine house above the control room. Vent openings are provided at the opposite end of the turbine gallery allowing exhaust air to be returned to the atmosphere.

In the boiler gallery blower fans situated at each end draw air from the side access galleries and feed a large duct running centrally beneath the floor. From this duct air is distributed throughout the boiler house. A proportion of air exhaust is obtained by reason of the natural aspirating effect of the forced draught, and ventilating ducts are provided above each boiler unit to allow hot air to escape into the atmosphere.

A subsidiary ventilating scheme is provided for the offices and control room to each of which pressure air is delivered by a fan and ducting. In addition, the washroom, kitchen and canteen are served by a separate exhaust fan drawing air through them and then back to the boiler house whence it is vented by the outlets provided.

Main and Auxiliary Switchgear

Each turbo-alternator set generates at 6·9 kV and is directly connected to a star wound auto-transformer which steps up this voltage to 11 kV at which voltage the main oil circuit-breakers operate. The high voltage switchgear is accommodated below the control room on a cross gallery running at right angles to the turbine and boiler galleries. The three generators feed five outgoing circuits and the switchgear is divided into three independent cubicle sets physically separated from each other but connected electrically through a bus tie-bar. Metering is provided for all circuits.

Low voltage supplies for auxiliary purposes are at 400 volts 3-phase and 230 volts single-phase. Each generator is provided with a unit auxiliary transformer of 500 kVA capacity which feeds directly to the associated turbine load centre. In addition, one transformer of 500 kVA is provided for standby purposes which is fed from the high tension bus tie-bar and feeds into a low voltage tie-bar to which each turbine load centre can be connected. A house-service diesel driven generator of 250 kW capacity is also connected to the low voltage tie-bar and therefore is able to energise each turbine load centre. From each load centre low voltage supplies are distributed to the corresponding boiler load centres, which supply and control all the boiler and turbine auxiliary plant. Other auxiliaries not associated with particular units of generating plant are fed from other load centres the supplies for which are divided amongst the three turbine load centres and low voltage tie-bar standby system.

By these arrangements a considerable degree of flexibility is provided to enable the minimum of interference to be caused by the breakdown of any unit of the plant.

Our thanks are due to Messrs. Preece Cardew and Rider for the information given above and for the photographs and drawings.

Our readers' views . . .

Outdated Definitions

IN common with many others I have felt for some years that confining the "medium" voltage range to voltages between 250 and 650 has outlived its usefulness, and that the range should either be eliminated or suitably extended. But as long as we have the present definitions of voltage ranges with us, can authors of articles be encouraged to use them? It is only adding to confusion when one is invited to read an article entitled "Protecting Medium Voltage Overhead Lines Against Lightning" (the third and last part of which appears in your issue of December 3rd) only to find that it deals with high voltage lines ranging from 11 kV to 33 kV.

H. Willott Taylor
Chief Engineer,
Southern Electricity Board.

◆ ◆ ◆

Smoke Abatement

THE paragraph in your issue of 19th November headed "Smoke Abatement Soc. Forgets Electricity," and briefly mentioning our two booklets of excerpts from the Ridley Report on National Fuel Policy, does not seem quite fair. The two booklets, which incidentally were prepared by a committee on which the electricity industry is duly represented, contain only:

1. The Report's appendix on smoke abatement, verbatim.
2. The Report's summary of recommendations on the domestic and non-domestic uses of fuel, again verbatim.
3. A few paragraphs of particular concern to smoke abatement that could be quoted in isolation.

The booklets do not contain any comment or additions of our own, and, of course, it would have been improper to quote statements incompletely or out of their context.

The booklets might, possibly with more point, also be criticised for not including excerpts, which some would consider pertinent, because they are not exactly helpful to electricity.

Arnold Marsh
General Secretary,
Nat. Smoke Abatement Society.

◆ ◆ ◆

Thermostats for Motor Protection

I WAS interested in Mr. Blanchard's article in your issue of 10th December and your comments thereon. I have little doubt that built-in protection is the only effective method of protection for small motors but why should it be limited to fractionals?

Why should it not be developed for 3-phase motors up to, say, 10 h.p.? On a mass production basis it should be no more expensive than the overload trips normally provided in contactor starters and would, I believe, prove more effective, for reasons which you, Sir, give in your editorial. It would be most interesting to know if any work is being done on these lines.

R. H. Cobbold
W. D. & H. O. WILLS,
BRISTOL.

Power in the East

Technical Activities of U.N. Economic and Social Council

INCREASED use of electric energy is a well established characteristic of the advance of industrialisation. As the countries of Asia and the Far East plan for more complete self-sufficiency, this fact grows in importance, and electricity supply projects are closely studied as an integral part of schemes for national advancement. A sub-committee of the United Nations Economic Council for Asia and the Far East is active in this work, and in the past few months has been issuing reports which indicate the path development may follow.

One difficulty in evaluating the present position of electricity supply in the areas concerned is the paucity of data, especially as regards industrial generation of electricity. India provides an example. Taking the 1951 figures, it is known that private generation by certain selected industries alone amounted to 1,655·6 m kWh (from 628 MW of plant). This is more than half the total electrical energy purchased by all industries from public utilities! The Federation of Malaya provides a similar example, with private generation at 119 m kWh comparing with total public generation for all purposes of 618 m kWh.

Bearing this in mind, it is estimated that on a 1951 basis, consumption per head for the whole area totalled 90 kWh, or excluding Japan (which has a level of 527 kWh/head) 15 kWh/head. This compares with 820 kWh for Europe over the same period, and 2,820 kWh for the U.S.A.

Recent Developments

Major developments in overseas electricity supply are, of course, noted in our "Overseas News" pages, but some of those for 1952 and 1953 summarised in the E.C.A.F.E. reports are worth repeating. In Burma little has been done, although several surveys have been carried out to provide information for future schemes. In China (Formosa) a five year plan is under way which contemplates the addition of 14 generating plants during the next five years aggregating over 300 MW. In Hong Kong a 20 MW set has been added (In general, the mainland of China is outside the E.C.A.F.E. interest).

India, of course, is also engaged in a five-year plan, and is well up to programme. One 150 MW plant commissioned during the year is designed to burn a low grade coal containing 36% ash. In Pakistan, over 200 MW of hydro-electric plant are scheduled for construction in the current five-year plan. 140 MW of thermal plant is planned as a more speedy answer to power shortages, and this may include about 35 MW of diesel plant.

Diesel plant is also a feature of recent installation in Indonesia. Twenty-four 1 MW sets had been commissioned in the eighteen months preceding August last. In Japan, there is a considerable expansion programme under way with 345 MW of thermal generating plant and 1,215 MW of hydro ordered for the years up to 1958. In spite of this, however, it is estimated that there may still be an 11% shortage of power in the latter year, under "medium" rainfall conditions.

Korea naturally poses a special problem, and one that is somewhat obscure. According to a government report quoted, by autumn 1953, damage to individual power plants varied from 5 to 50%. Transmission lines had suffered considerably less, but sub-stations were very badly hit, some being 90% destroyed.

In Singapore a large 52 MW generator was commissioned; in Malaya a 40 MW generator. Thailand added one 7 MW steam plant and several MW of diesel sets, while in the Philippines constructional work on some 200 MW of hydro schemes was under way.

At the other end of the scale come Brunei, Cambodia, Laos, and Sarawak. In Laos for instance, an addition of 600 kW of generating capacity is contemplated—and this will increase the public supply by three-quarters!

Integrated Systems

In the long run, integrated systems will be required to supply the full needs of the peoples in these eastern regions, and already attention is being given to the problems and possibilities involved. It is natural, therefore, that the Sub-Committee on Electric Power of E.C.A.F.E. should have approved for study a project such as "Co-ordinated Development of Hydro and Thermal Power and Integrated Power Development."

For this purpose, the experts concerned

have defined an integrated power system as one in which all the facilities of individual power systems are connected together physically and made to work continuously as part of a system; in other words, no part of a system is left unexploited for the benefit of the consumers connected to the system at any time of the period of service.

Of course, many of the problems of organising an integrated system are common to all countries, in the East as in Europe. Technical, economic, social and, in some cases, political problems are involved. However, there are some difficulties of special interest to E.C.A.F.E., and a discussion of these brings out some interesting technical points.

Generation

Hydro stations in monsoon countries must deal with a stream flow carrying from hundreds of thousands of cusecs during the flood season to a mere trickle during the dry weather. This gives a special importance to water storage. Then again, there is a tendency to undertake multi-purpose projects, in which the power production capacity is controlled by the requirements of irrigation rather than power consumers' demand. Unfortunately, the generation capacity of a multi-purpose river valley development is the reverse of the normal load demand of a system: when the demand is highest, in winter, the output is lowest, because there is no flow in the irrigation canals.

In the case of steam stations, the most important question is that of finding some means of utilising the lignite and other low-grade coals possessed by countries in the area. Resources of high grade coal are, in general, very meagre. The most economic way of utilising the low-grade coals is to establish a large-size power station near the mine. Sometimes the prospect of "firming" hydro power can turn this from an uneconomic prospect into one that is financially practicable. Hydraulic transport of the coal may be helpful in permitting the best siting of the power station.

Transmission

In general transmission schemes are considered as likely to follow conventional lines. The conclusion is stated, that technical developments in the design of d.c. high voltage circuit-breakers have not advanced adequately, and that the cost of terminal equipment continues to be high. For this reason, the adoption of high voltage d.c. transmission is considered a question of the distant future and the report gives no detailed discussion of its possibilities in the area.

Strange flora and fauna demand special techniques to modify standard practice. Pole climbing can be regarded by rural youth as a test of skill, and a mixture of propaganda and barbed wire wrapped round line poles is needed if fatal accidents are to be avoided. Monkeys, not unnaturally, climb the poles as though they were trees, and while they move about playfully on the top of the towers, their long tails get within arcing distance of conductors. To quote the report, "the result is an interruption and a dead monkey." Barbed wire is once more a fairly effective answer.

Elephants, on the other hand are little affected by barbed wire. Their vice is the uprooting of single poles or the bending of different members of towers by dashing against them. An effective method of stopping this is to dig a ditch three to four feet wide and about three feet deep around the tower. Elephants are unwilling to cross such a ditch, and the danger is effectively eliminated.

Bird Problems

Interference from birds is of two kinds. In one case, birds with a large wing span fly between the conductors, reducing the arcing distance and so causing a flashover. Another habit of large birds is to roost on top of line towers. Of itself, this does no harm, but the birds have a knack of choosing a spot on the top of a string of insulators. In these circumstances, their droppings accumulate on the insulators, and eventually reduce the insulator strength to a point where a flashover occurs. To prevent this, tooth-edged bird guards are fixed just above the points of insulator suspension.

These, then, are some of the more important considerations special to Asia in the development of large integrated power systems. However, as the E.C.A.F.E. report is careful to stress, such a system cannot be established overnight. Firstly a few generating facilities are interconnected, and then the whole process of electrical supply is gradually brought into one organisation over a wide area. The important thing is that the many new generating stations and the few local supply grids which are being established in the East as the result of implementing various five-year plans, should be so designed that they can be linked solidly with neighbouring systems eventually.

So far as there may be internal political barriers to the interlinking of power systems in a country, it is assumed that these can be overcome in the way that the American States have tackled the problem. Only between India and Pakistan is there any likelihood of any early question of international linking of power systems.

Burning Lignite

The importance of lignite to the power development of the E.C.A.F.E. area has already been mentioned. An investigation is in progress into the exact problems which the use of this type of fuel will involve, and a preliminary report on the matter has been issued. Because of the present tendency to use these fuels in an unprocessed form in steam boilers, special attention has been given to the effects of moisture, ash content, and fuel size on performance. Early consideration of the points raised in the study may, it is felt, avoid the need for considerable capital expenditure later.

The high moisture content of lignites in their raw state affects the design of bunkers and fuel handling plants, which have to be over-dimensioned to cope with the difficult nature of the material when it carries external moisture. Moreover, water in the fuel decreases boiler efficiency by imposing higher flue gas losses and a lower furnace temperature. Fan capacities have to be greater because they must deal with the water vapour that is driven off. Finally, moisture must be evaporated before the lignite can be ignited, and this demands certain changes in furnace equipment.

These are only some of the more general difficulties introduced by the use of lignites. Other more special problems which are receiving attention are the effect of salt and sand in the lignite ash, and the tendency of lignites to disintegrate on exposure to the atmosphere. This latter characteristic means that special care must be taken in crushing and handling plants to avoid the production of fines in the fuel.

Firing

Up to the present time experience in the E.C.A.F.E. region has been mainly with chain grate boilers. These are not, as a type, suitable for the firing of high moisture coals, and if they are to be employed for this purpose, a number of modifications are necessary. Step grates, of the type used in Germany, still find application in some types of boiler where very wet coal has to be fired. In recent years there has been an increase in the attention given to the spreader stoker as a particularly versatile type. It seems likely to be particularly suitable for power stations in the East which might have to burn imported fuel as an alternative to indigenous lignites. Of course, where boilers in large sizes are installed, the continental practice of using mill firing with the incorporation of a drying system would appear to be appropriate. In this respect it is interesting to note that tests are proceeding with certain modifications of the cyclone furnace to provide a method of burning particularly difficult lignites.

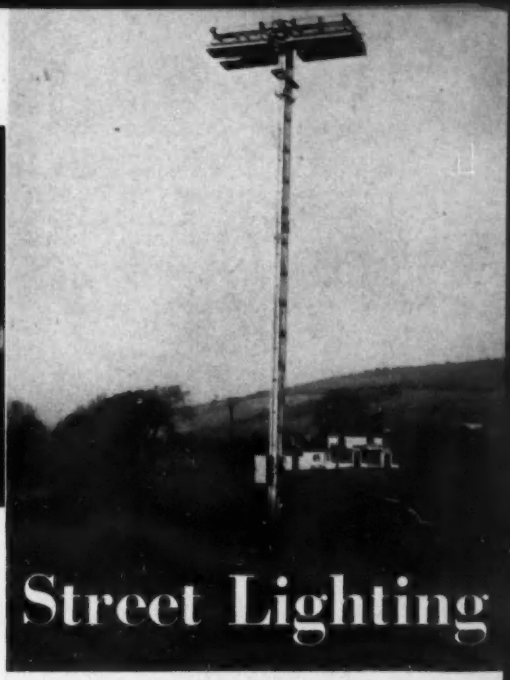
In this respect it is noted that tests in Germany have indicated that the cyclone furnace, as accepted in the United States, is not suitable for lower-grade lignites. The secondary air pressure and the consequent high power consumption weigh heavily against this design. Pre-drying may be necessary, as may some degree of milling.

Siting is of course of great importance where lignites are the main fuel. The economics of using this fuel in a power station are such that great advantage can be derived from placing the power station close to the mine. Inevitably, the low grade of the fuel increases the capital costs of a station in comparison with high grade bituminous coals, and the cost per heat unit of lignite has to be well below the comparative figure for high grade coal to make its use an economical proposition.

As a result of these considerations, it is concluded by the sub-committee investigating the matter that in the exploitation of lignite resources, due attention should be paid to the need for a technical advisory service as a permanent part of the marketing organisation. Qualified engineers should be available to organise tests on existing plants of potential users to advise them on the best methods for conversion to lignite firing, and to supply information on combustion, transport and storage problems.

Conclusion

These brief notes survey only a part of the field of investigation which is being covered by the Electricity Sub-Committee of the United Nations Economic and Social Council for Asia and the Far East. It is hoped, however, that enough has been said to show that this branch of United Nations activity is being pursued as diligently and as usefully as that of the sister European body, whose work is more frequently the subject of articles in these columns.



Experiment in Street Lighting

IT is commonly recognised that one of the major problems confronting lighting engineers when planning an installation for traffic routes is that of ensuring good road luminance with the minimum of glare. Cursory examination of the factors contributing to the problem shows that of all the variables which affect the final conditions, those of lantern mounting height, column spacing, and light distribution of the lantern make the greatest contribution.

The relevant British Standards Code of Practice (CP1004: Part 1:1952) stipulates that on traffic routes classified as being in Group A, lantern mounting height shall be 25 ft, with tolerances of +5 and −1½ ft. For lantern having non-cut-off distribution, a column spacing on straight roads, of 120 ft is recommended; in other words, a spacing/mounting height ratio of the order of five. Where complex or difficult junctions, or roundabouts are to be lighted, the problem becomes necessarily more acute. More light is needed at the confluence of main roads, which involves the use of a greater number of columns and lanterns. Siting of the additional fittings has to be considered with considerable care or the driver of an approaching car will be faced with a misleading array of light sources.

In the heading illustration, Figs. 1 (left) and 2, are seen night and day views of the experimental installation

Illumination for Special Sites

For illuminating such road intersections, and, in addition civic squares, and broad promenades commonly found along sea fronts, the South Eastern Electricity Board has been recently conducting experiments with light sources mounted at twice the normal height above the road surface. Originally, when considering the longevity of life most discharge lamps—particularly the fluorescent tube, whose average life is now 5,000 hours—the Board felt that it would be useful to conduct experiments along these lines, using discharge lamps whose increased reliability would offset the difficulty of lamp replacement with columns two or three times the present normal mounting height. Consequently, at the beginning of this year, a single pole, 50 ft in height was erected at a fork in the main London-Brighton road at Pyecombe, Sussex. The site, a junction of two busy roads at the crest of a hill held particular promise in view of the oblique angle of approach of the secondary road, and of the bend away from the junction in the main road past the junction.

Any consideration of this installation must, however, recognise at the outset the experimental nature of the project. Thus, expediency and economics were the main factors in selecting equipment which was to serve only temporarily in order to establish the principle.

For the pole, the essential requirement was simplicity. It was found that poles over 60 ft in height would require stay wires, whilst an 80 ft lattice type tower had too wide a base, considerations which established a maximum mounting height of 50 ft. The pole finally used was a "P.B." lattice type pole, of Painter Bros. manufacture capable of carrying a lantern load of 400 lb and of withstanding windage up to 80 m.p.h.

Type of Lamp

The aim, when deciding the type of lamp to be used, was a total light output of 50,000 lumens from the complete fitting. Although a xenon arc lamp, under-run at 1 kW, was initially considered, its life could not be improved beyond 500 hours. Eventually, the fluorescent tube was chosen, its life being such that lamp replacement costs would not be excessive, although standard sodium or mercury vapour lamps would also have given the required light output. Lanterns for the tubes were standard three 80 W lamp trough reflectors, made by the General Electric Co. and modified by them to house four tubes. Four such lanterns are used in the equipment.

Simplicity was the keynote of lantern suspension, to facilitate their positioning, and to ensure ready accessibility at ground level. A structure in the form of a letter "H" was fabricated from channel section steel girders, and secured to the top of the main girders of the pole as shown in Fig. 5. Additional cross bars added rigidity and provided the supports from which the lanterns themselves were suspended. (Fig. 7.) To each reflector was attached additional framework, with an eyed lug projecting vertically from each corner so that the lantern could be raised by winch gear. The lantern was positioned so that the hole in each lug coincided with corresponding holes in the cross members. Pointed steel rods were then pushed by hand through each to give a simple, rigid and reliable fixing.

Fig. 3. Before erection, showing the trench awaiting the base of the pole

Raising and Lowering Gear

Although hand operated raising and lowering gear was used, changed by hand from one lantern to another by means of a "clip" pulley, economics and ease of maintenance may suggest automatic equipment in a permanent installation.

Fig. 4. Here is seen the fitting at the Twickenham site, showing the nature of the area to be lighted

Pole erection gave comparatively little difficulty. To receive the pole a 6 ft 6 in. hole was dug, one side letting into a trench of tapering depth to guide the pole. Using a mobile crane the pole was lifted through some 45°, when it was transferred to block and tackle fixed on a shear leg. By means of the latter, in conjunction with the crane, erection was completed. The hole was then filled with concrete to a depth of 6 ft.

Control gear for the lamps, instant start being used, was housed separately in a metal box some way up the pole. Individual connections were brought out for each lamp and its gear, to enable any combination of lamps to be energised at will. Supply was taken from an o.h. line situated conveniently on the opposite side of the road. A cable was run

over the road to the top of the pole, being sufficiently high to be clear of traffic.

After being put into commission on the 5th January, 1953, the lamps were allowed to "age" for 100 hours before taking any measurements. Total light output of the 16 lamps was approximately 48,000 lumens which, at a radius of 10 ft from the pole gave an illumination of 4 lumen/sq ft at the road surface. At 200 ft from the pole illumination was 0·13 lumen/sq ft—in effect, an average illumination of Group A standard over a length just short of an eighth of a mile. Quite good illumination was obtained beyond this distance along the main axis of distribution.

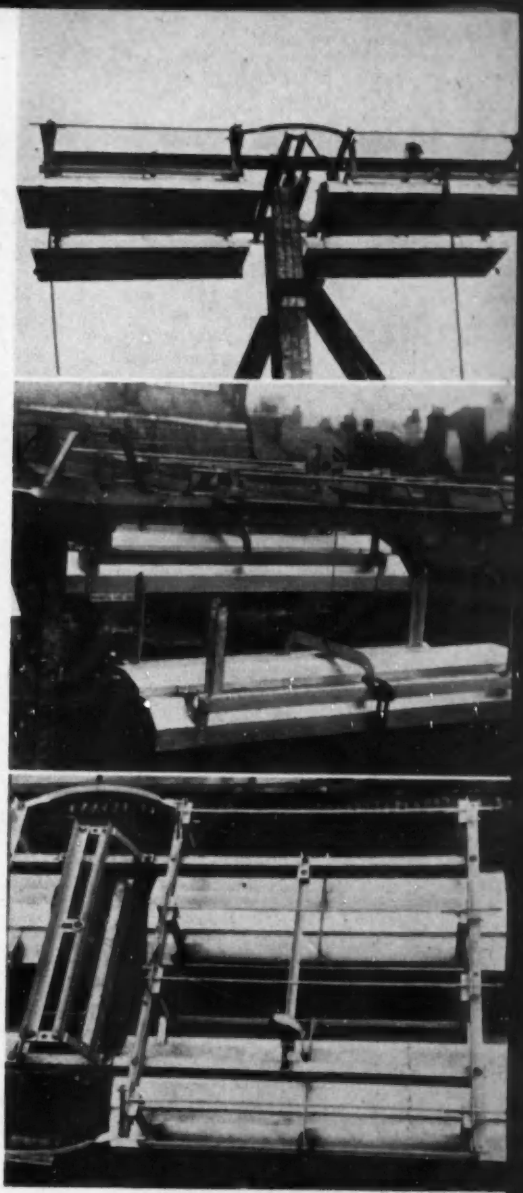
Luminance of Road

Some idea of the road luminance conditions in the area of the pole is given by the photograph in Fig. 1, which, incidentally, was taken after a shower of rain. The photograph tends to exaggerate the brightness of the fluorescent source, but it can be appreciated that, to an approaching motorist, the fitting will rise above field of vision whilst he is still some distance from the junction.

During the 7 months or so the installation was in use at Pyecombe, favourable comments were received by the Board from users of the two roads living in that locality. For a permanent installation special fittings could be manufactured—inverted mushroom and cruciform are two possible designs—to reduce the diversity between maximum and minimum levels, and to obtain a greater coverage area. At present, the aim of the Board is to investigate possible sites at which the unit could be used to advantage, to which end it is now installed at a roundabout on the main Chertsey by-pass, at its junction with Hospital Bridge Road, Twickenham.

Here the site is completely different from that at Pyecombe, the unit having a considerable area to illuminate. The roundabout itself is approximately diamond in shape, the length of side being some 40 to 50 ft. A circle of radius averaging between 60 and 80 ft has therefore to be illuminated with the maximum possible illumination toward its circumference, rather than the centre.

At present, no form of light control other than the original reflectors is being used, although experimental work along this line may be commenced. Intensity of illumination at the road surface is therefore unchanged from that at the first site. The presence of London Airport, however, requires that little or no light above the horizontal can be permitted. Conditions at this particular site are thus likely to be the most severe for such a fitting, and hence a useful evaluation of its suitability can be obtained.



Figs. 5, 6 and 7 (top to bottom). These three photographs illustrate the method of raising and mounting the lanterns

Acknowledgment is made to the South Eastern Electricity Board for permission to publish information in this article.

NOTES ON WIRING by Megohm

Stores on Site

THE storage, issue and check of materials and plant on site and the way site stocks are kept during progress of works is an important factor. The storage of valuable materials and equipment in contractors' site stores sometimes leaves much to be desired and there certainly must be loss of time in trying to find and keep a check on materials housed in such stores.

Accurate Recording

A good site stores organisation is a valuable asset on any site and is not necessarily expensive or difficult to arrange. The accurate recording of incoming and outgoing materials so that a reasonable assessment can be made is essential. The first step is to fit up the stores hut with bins, which can be made from tea chests and the like, so that when materials arrive they can be segregated and neatly stored and visible. As materials and plant are delivered they should also be entered in a goods inward book and the top sheet returned to the contractor's head office at least once a week or as soon as each sheet is completed if the volume of deliveries is so great as to make this more frequent.

Requisitioning

The distribution of outgoing materials to buildings or sections of the work should only be issued by the storekeeper against receipt of a chit signed by the electrician in charge of each section of the works. A periodical check of the materials issued as detailed on the chits against materials received will enable the storekeeper to keep the foremen advised on the position of stocks, thus avoiding last minute rush orders and possible delay in completing the work, if not complete stoppage and the necessity of transferring men to other jobs and perhaps other sites.

The requisitioning of materials from site stores will enable the foremen to see that unnecessarily small or large quantities of materials are not withdrawn, from time to time, thus preventing wasteful journeys to and from the stores and the alternative of leaving valuable materials out on site over-night. Both conditions are obviously bad and with reasonable check may be easily put right. It is surprising the amount of small conduit and fixing accessories, such as boxes, bushes, lock nuts, sockets, saddles, etc., that can be seen lying about on some building sites and it may be due to the fact that the men do not appreciate the value of these items, which can range from 3d. to 2s. each. Their being around in quantity discounts any sense of cost.

Routine for Chasing

Where orders are placed for delivery of materials some time ahead, the storekeeper should enter such materials on goods outstanding sheets. In the event of not being advised that the materials listed are or will be despatched within a few weeks of the promised date, or where special attention has to be given to progressing materials in short supply, a copy of the goods outstanding sheet should be posted to the Head office or main stores with a covering note stressing the urgency of delivery. It should, however, be remembered it is not wise to stress urgency with every note since this leads to mistrust and may point to late ordering of materials by the site stores.

Receipts Needed

The issuing of contractors' plant from the site store likewise should only be done against the receipt of a chit from the electrician to whom the plant is issued. All portable plant such as power operated tools, insulation testers, continuity testers and the like should be returned to the stores each night or immediately they are not required in any particular location on site. When plant is returned to the stores in defective condition this should be recorded on a plant repair sheet giving date and details of defects, and arrangements should be made to have the repairs carried out promptly.

Site ordering, storing, recording, dealt with on the foregoing lines should be of general assistance to men on site whether the contract is a small or large one and should minimise last minute headaches in finding that some trivial or even important item for the installation has been overlooked in the general rush and muddle of an unsystematic method of site storekeeping practice.

Fault-level Calculation

An Improved Approximate Method using a Nomogram for Cable Networks

By J. G. BOGGIS, A.M.I.E.E., G.I.Mech.E.

BEFORE introducing a new approximate method of calculating symmetrical fault levels, the difficulties experienced with the existing methods require some explanation. The only difficulty with the exact method, which considers vector impedances and their combinations as vectors, is the laborious arithmetic. To avoid this labour two approximate methods of calculation have been devised: the "reactance-only", and the "scalar-impedance" methods. They are both well known.

It is a great pity that the reactance-only method (resistance being neglected[1]), should have been so widely recommended in books and articles, and taught to engineering students. Unless used with extreme caution it will result in the installation of unnecessarily heavy-duty switchgear. The fault levels, calculated with resistance neglected, are on the safe side, we are told. But from the point of view of economy and good engineering practice, why install more expensive switchgear than is required?

Certainly not an isolated example is a comprehensive short-circuit calculation worked out in a book (Ref. 2, p. 37), where the resistance of 2·5 miles of 0·15 sq. in., 11 kV cable has been neglected*. The calculated level of 197 MVA is reduced to 125 MVA when resistance is taken into account: about £1,000 in switchgear costs would be saved in this example by an easy calculation taking ten minutes.

Perhaps not quite so well-known is the scalar impedance method, in which it is assumed that all the parts of the circuit have about the same phase angle, and may be combined by the simple methods used for d.c. networks. From Fig. 1, which shows the maximum error involved in the approximation, the working range of 30° for the phase angles can be ascertained. For example, the impedances $10/\underline{30}°$, $10/\underline{45}°$ and $10/\underline{60}°$ ohms are approximately summed as 30 ohms, which compares favourably with the true value of 29·3 by vector summation. But note that $10/\underline{30}° + 10/\underline{90}°$, where the range of phase angles is 60°, is 17·3 —not 20 ohms.

When applied to a cable network this scalar-Z approximation gives good results in general, but it has one serious weakness. Unlike the cable network, the bulk-supply point

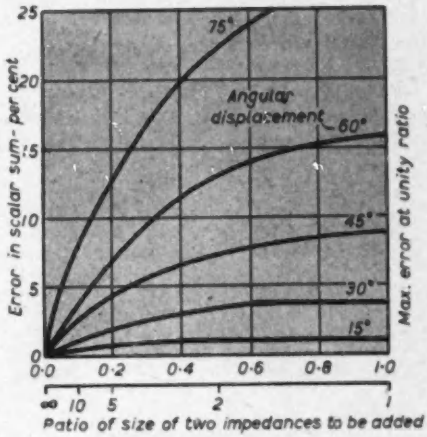


Fig. 1. Error caused by scalar impedance approximation

is invariably highly reactive in its impedance characteristics, since transformers and generators have X/R ratios of about 10 to 1. The corresponding phase angle φ in Fig. 2 is 80°-90°. In contrast, the resistance of the cable network predominates with phase angles θ of, say, 10°-40°. It follows that the approximation may be expected to fail at the point where the cable-network (resistive) impedance is added to the bulk-supply (reactive) impedance.

As an example of the error caused by the scalar-Z method, consider the radial 11 kV feeder shown in Fig. 3, which is made up of lengths of 0·1, 0·15 and 0·25 sq. in. 3-core cables. Summing the cable impedances, see Table 1, we find that the approximate value of

* In fairness to the author of this excellent little book, it should be mentioned that he does point out the significance of resistance for cable networks.

0·572 ohms is in good agreement with the true impedance of 0·567 ohms. The error so far is only about +1%. Finally, however, the addition as scalars of the network and bulk-supply impedances causes the serious error of +16%.

TABLE I. NUMERICAL EXAMPLE (SEE FIG. 3)

Item	R ohms	X ohms	Z ohms
1,000 yd 0·1 sq in. ...	0·248	0·082	0·261
1,000 yd 0·15 sq in. ...	0·169	0·076	0·186
1,000 yd 0·25 sq in. ...	0·101	0·072	0·125
Bulk supply	0·060	0·600	0·603
Cable only—Sum ...	0·518	0·230	0·572*
Total impedance ...	0·578	0·830	1·175*

* Scalar-Z values obtained by simple addition

True impedance for cable $=\sqrt{(0{\cdot}518^2+0{\cdot}230^2)}$
$=0{\cdot}567$ ohms.

True total impedance $=\sqrt{(0{\cdot}578^2+0{\cdot}830^2)}$
$=1{\cdot}015$ ohms.

Improved Approximate Method

In view of the failure of both the reactance-only and scalar-Z methods to give consistently accurate results, a search was made for an

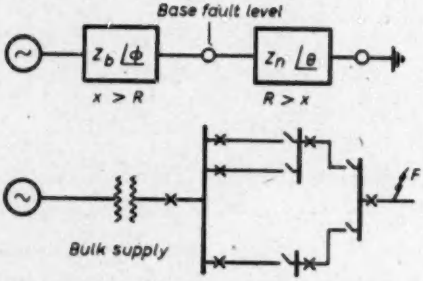


Fig. 2. Division of whole network into bulk supply and cable network

improved approximation. The basic principle of the proposed method is to retain the scalar-Z approximation for the cable network, but to revert to vector addition for the final addition of the network and bulk-supply impedances. By these means accuracy is not sacrificed for ease of working.

Let Z_b/φ be the bulk-supply impedance, and Z_n/θ be the network impedance, then vector addition by formula (1) is possible, though inconvenient.

Total impedance=

$$\sqrt{\left[Z_b^2 + Z_n^2 + 2Z_b Z_n \cos(\varphi-\theta)\right]} \text{ ohms} \quad (1)$$

Fortunately, with the aid of the nomogram the vector addition is simplified to an automatic process. A more accurate nomogram will be found in Rybner's collection[3]; though, since it was not designed for the particular purpose of short-circuit calculation, it is not so convenient.

Bearing in mind that the *base* used for per-unit (or percentage) calculation is arbitrary, the fault level at the bulk-supply point is chosen as the base so that Z_b becomes unity (or 100%). Equation (1) now reduces to:—

Total p.u. impedance=

$$z_t = \sqrt{\left[1 + z_n^2 + 2z_n\cos(\varphi-\theta)\right]} \quad \ldots.(1a)$$

This choice of base, instead of the conventional 100 MVA, causes no difficulty. As a preliminary to the main calculations, a table is

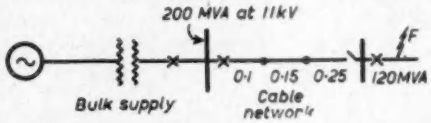


Fig. 3. Radial 11 kV feeder. For characteristics see Table I

formed of the scalar-Z values per 1,000 yards, for the various cable sections, converted to per-unit values. Then

z_{pu}=(Z ohms × fault level at bulk supply)/kV² .....(2)

Apart from the simplification of equation (1), by expressing the impedances in this way, we gain a clear insight into the relative importance of the network and bulk-supply impedances in limiting the short-circuit currents. Obviously, if z_n the network impedance is eight or more, an increase in the fault level at the main station will have little effect on the fault level at the distant substation.

Magnitude of Error

In accordance with the scalar-Z approximation, the fault level for $z_n=8$ would be calculated from

$z_b=1 \quad z_n=8 \quad z_t=z_b+z_n=9$

Fault level=(Base fault level)/9

Now suppose that z_b has a typical phase-angle φ of 84·3° corresponding to X/R=10; and that z_n has a phase-angle θ of 24·3° which corresponds, roughly, to the X/R ratio of a 11 kV 0·15 sq in. 3-core belted cable. From $\varphi-\theta=60°$ on scale "F" of the nomogram, a line to 8 on "B" cuts "C" at about 8·55, i.e.

$$z_t = \left|1+8\angle 60°\right| = 8{\cdot}55 \text{ instead of } 9.$$

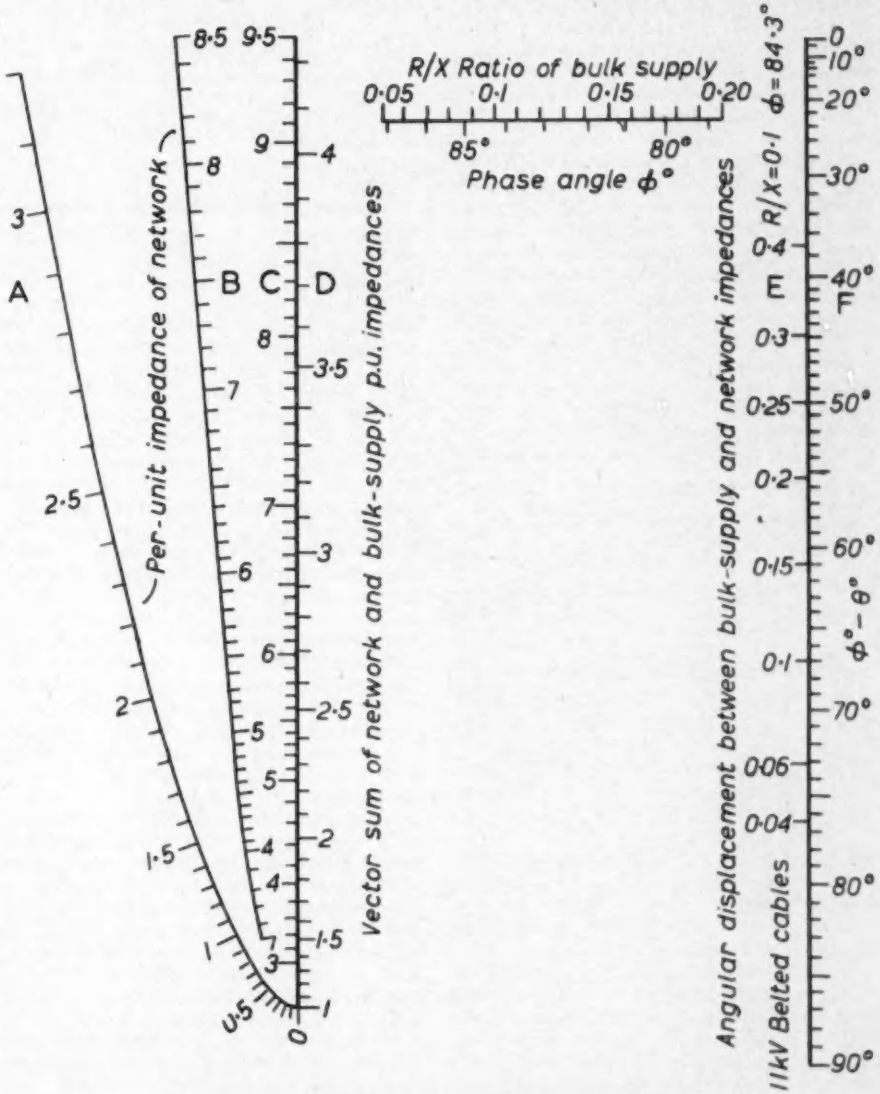
To gain practice, another example is $z_n=3$, $\varphi-\theta=50°$ which requires the use of scales

"A," "D" and "F." The answer obtained by scalar addition, namely 4, compares unfavourably with the vector sum of 3·72 read on scale "D" on the nomogram.

Network Phase-angle

If it were necessary accurately to determine the network phase-angle before the nomogram could be used, there would be no advantage in the proposed method of short-circuit calculation. So insensitive, however, is the vector sum to errors in the angle that a quick mental estimation, based upon the predominant cable section, is sufficient.

For 11 kV and 6·6 kV cable networks with 3-core belted cables, the procedure is facilitated by scale "E." For other networks it is an easy matter to modify this scale. Should the



This nomogram facilitates the rapid calculation of fault levels

bulk-supply X/R ratio differ from the 10 to 1 assumed in scale "E," the double-sided scale at the head of the nomogram will inform the reader whether the difference is significant and cannot be ignored.

To return to the example set out in Table 1, the first step is to convert the ohmic values by using equation 2 with the base fault-level taken as 200 MVA at 11 kV. The impedance of the first leg (0·10 sq in.) is converted from 0·261 ohms to $(0{\cdot}261 \times 200)/11^2 = 0{\cdot}431$ p.u. Likewise, the impedances of the second (0·15 sq in.) and third (0·25 sq in.) legs are 0·308 and 0·206 p.u., making a total of 0·945 p.u.

Without calculation, the intersect on scales "E" and "F" is estimated to be near 0·15 sq in. with a bias towards 0·10 sq in.; say at 63°. The vector sum is 1·67 read off scale "D," which allows us to determine the fault level as $200/1{\cdot}67 = 120$ MVA, since 200 MVA is the per-unit base in this example. An exact calculation gave a result of 119 MVA, so that the error is trifling.

One obvious difficulty with the nomogram is that the network impedance may (rarely) exceed 8·5 p.u. and fall outside the range of the scales. In such cases: subtract a round number to bring it just within the scale; enter the nomogram and add back again the round number to the result. For example, find

$$1 + 10/\underline{60^\circ}$$

(a) Subtract 2 and enter "B" with 8 p.u.
(b) Read off 8·55 on "C."
(c) Restore the 2 to give 10·55 p.u.

It is interesting to compare this value with equation (1a) which reduces to $\sqrt{(1+10+100)} = 10{\cdot}54$ p.u.

Limitations and Extensions

More difficult networks are handled with equal facility. The only serious limitation to the method is that the network must have—in effect at least—only one bulk-supply point. Two or more bulk supplies which are paralleled through the network cannot be dealt with.

Another limitation occurs where z_n is fractional owing to a high-impedance bulk supply and a compact network. If z_n is less than 0·5 the nomogram is inconvenient, but the reactance-only approximation is likely to succeed in such cases.

Extension of the method to l.v. networks is straightforward; the transformer substation or generator is treated as the bulk supply. Again, the calculation of earth-fault currents by symmetrical-components is a problem which could be attacked by the combination of scalar and vector addition.

How well does the method work in practice? In comparison with the exact method involving lengthy computation, errors of less than 5% were observed for the short-circuit levels of an extensive 6·6 kV cable network. Where the errors were significant they were traced to slips in the arithmetic of the exact calculations. It is a paradox that approximations can often be more precise than calculations which pretend to be exact.

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Copper-Manganese-Tin Alloys

A RECENT publication by the Tin Research Institute gives details of the structure and mechanical properties of copper-manganese-tin alloys. The work was stimulated by the growing availability of high-purity manganese, which might possibly be used as a substitute for some of the scarcer metals, in particular nickel. A considerable amount of work has already been done on the effects of adding small amounts of manganese to other metals and alloys but for several reasons, particularly melting and casting difficulties, the high manganese-content alloys have not been widely used. The work described in the report has, however, indicated that copper-manganese-tin alloys of suitable composition compare favourably in colour and mechanical properties with copper-nickel-zinc alloys. The corrosion-resistance of the new ternary alloys has not yet been systematically examined, but preliminary tests indicate that the alloys will adequately meet service requirements in this respect. The range of alloys dealt with varies from 3 to 25% of manganese with tin varying between 4 to 17%.

Good mechanical properties are obtained if the quenched alloys are cold-worked before tempering, but if cold working is omitted the alloys exhibit brittleness. Within the composition range investigated it was possible by suitable treatment to obtain tensile strengths up to 30 tons/sq in. with elongations of up to approximately 45%. The tensile strength can, however, be increased to a maximum of 40 tons/sq in. though above 33 tons/sq in. there is a progressive and fairly rapid fall in the elongation. The work was carried out by Dr. J. C. Blade and Dr. J. W. Cuthbertson.

The Future of Power in Britain

Sir John Hacking Reviews Electricity Prospects

ADDRESSING, as President, the Junior Institution of Engineers, Sir John Hacking gave a most interesting and comprehensive review of "Developments and Future Possibilities in Electricity Generation." After a brief introduction, sketching the background of the early days of the supply industry, he came to the present situation, when it is estimated that, despite the intensive building programme, the country as a whole would still have a deficit of 1,500 MW should the weather become exceptionally severe. The Authority wished to raise the rate of commissioning to 2,000 MW per year as soon as possible. This however could not be obtained unless an alleviation was made in the restrictions on capital investment. It was hoped to get agreement to an increase to bring the figure up to 1,950 MW in 1959.

Sir John then dealt with the reasons for the establishment and development of the 132 and 275 kV Grid systems.

New Generating Plant

Shortly after the war, two sizes of generator were adopted for future programmes: 30 MW with steam conditions of 600 lb/sq in. at 850° F, and 60 MW with steam conditions of 900 lb/sq in. 900° F. Some twenty-eight 60 MW units had been put into commission since the war and this size was rapidly superseding the 30 MW size which was now only included in future programmes to complete an early development or in exceptional circumstances. Of the 10,000 MW of new plant under construction or planned in programmes up to and including 1958, 6,000 MW will employ steam at 900 lb/sq in., 900° F, and 2,000 MW will be at higher steam conditions. A number of 100 MW sets to operate at 1,500 lb/sq in. and 1,050° F are on order. It was thought to standardise on these, but now a number of 120 MW sets employing reheat with initial conditions of 1,500 lb/sq in., 1,000° F with reheat to 1,000° F were being planned. As far as thermal efficiency was concerned, over the past twelve months, the average for all BEA stations had been about 23%. By 1960 it was expected to be 26% and within the following ten years might attain 30%.

Factors contributing to this increase were the increasing use of pulverised fuel firing, adoption of the unit system and the reintroduction of the reheat cycle. An interesting experiment in boiler design is the use of cyclone burners in one of the new boilers to be installed at Barking "C" station. Crushed coal will be used instead of pulverised fuel. The use of hydrogen as a cooling medium had shown important advantages and was now standard for all sets of 60 MW and over. Some designs of 100 MW and 120 MW will also incorporate direct hydrogen cooling of the rotor conductors.

Future Steam Cycles

Future steam cycles might be broadly divided between those below the critical pressure of 3,200 lb/sq in. and those greatly exceeding it being in the range 4,500 to 6,500 lb/sq in. Experience showed that for the drum type of boiler, the limiting pressure was in the region of 2,700 lb/sq in., and the Authority was now planning a plant to work at this pressure, for commissioning in 1959. After allowing for pressure drops in pipework, etc., the pressure at the stop valve would be about 2,350 lb/sq in. Initial temperature would be about 1,100° F, and reheating would take place back to 1,050° F at about 550 lb/sq in. Using high ash content British coals, the sent out efficiency should be about 37·6%. The economic size of the generators for a plant of this nature worked out at 180 to 200 MW, and they could be built as either tandem-compound or cross-compound units running at 3,000 r.p.m. In the first case a single 180-200 MW alternator would be required and it would be necessary to use a combination of hydrogen-cooling with oil-cooled stator bars, whereas a pair of 90-100 MW alternators required for the cross-compound case could be hydrogen-cooled only.

An experimental super-critical steam plant of 75 MW capacity was to be installed in Germany, and another of 120 MW capacity in the United States, but the detailed designs were still in course of development. It was estimated that with an initial pressure of around 6,000 lb/sq in., with a temperature of

1,200° F for superheat and reheats, the corresponding figure for thermal efficiency would be about 42½%.

Although gas turbines were firmly established in the aircraft field they were still only in the early experimental stage for power generation, where conditions were entirely different in that the machines were required to be larger in size, to run for much longer periods between overhauls, and to have a much longer life. At the moment, they could only operate on relatively expensive oil or gas fuels and were thus unlikely to prove economic in this country unless they could be developed for coal burning. The Ministry of Fuel and Power, in collaboration with manufacturers, was however carrying out a number of most interesting experiments into the use of pulverised coal and peat.

Existing Gas Turbines

The highest thermal efficiency believed to have been reached with a gas turbine set was 34·8%, obtained during recent tests of the 27 MW Brown Boveri open-cycle machine installed at Beznau. As higher temperatures became practicable, it might be possible to obtain thermal efficiencies of over 40%.

At the moment, most of the successful gas turbines were operating on the open cycle, and the B.E.A. was installing two 15 MW machines of this type; one was already in experimental service at Trafford power station and the other, at Dunston, was proceeding. A third unit was a 12·5 MW closed-cycle set which the North of Scotland Hydro-Electric Board was installing at Dundee.

To burn solid fuel there were three different experimental arrangements. One was direct internal combustion, a second was to gasify the coal and burn the gases internally and the third used an externally fired air heater. Should these experiments prove successful, the gas turbine would become more competitive with steam plant, over which it had the advantages of flexibility of operation, smaller space requirements, and much less cooling water. As one of the main factors limiting the capacity of plant which could be located at a particular site was the amount of cooling water available, the use of gas turbines would make it possible to have a much greater capacity at one site.

A further possible application was to use the exhaust of gas turbines to heat boilers which in turn would power steam turbines.

An interesting proposal in this country utilises steam as the working fluid in a gas-turbine cycle, and this is under investigation.

Sir John had some pertinent remarks to make on the subject of combined generation of electricity and heat. He classed this as a method of obtaining improved thermal efficiency in the broad sense that it made better use of fuel. In a strict sense, the oft repeated statement, that combining the generation of electricity with that of heat doubled the overall efficiency was apt to be misleading. The function of a heat engine was to convert thermal energy into mechanical or electrical energy, and the efficiency could only be a measure of this conversion. Simply to add waste heat recovery to the much more valuable electrical energy was an inadmissible confusion of two essentially different things and deprived the term "efficiency" of all real meaning. Nevertheless, combined generation was attractive provided markets were available, and the B.E.A. was prepared to investigate proposed schemes.

Other Sources

On electro-chemical energy, Sir John pointed out that investigations on useful fuel cells were at an exploratory stage, although long-term prospects were sufficiently promising to justify appreciable research. Hydro-power was limited, and because of the high capital cost and organised opposition, many schemes had been shelved. Tidal power, as exemplified by the Severn Barrage scheme, might be practicable to proceed within a period of trade recession. The source of energy most likely to replace coal was nuclear energy. There did not appear to be any insuperable difficulties in technical development in this field, but it would be necessary to develop the "breeder" reactor which, using uranium very much enriched in U235, could both produce power and plutonium from U238 at a greater rate than that at which the U235 is burned. Thus a large proportion of the U238 could be used, and the total energy reserves on this basis would be of the order of 40 times the existing reserves of fuel.

The probable development would therefore be first to use thermal reactors burning U235 to produce a certain amount of plutonium, and then, when breeder reactors were available, to use uranium greatly enriched in U235 or plutonium. A further nuclear fuel, U233, could be produced from thorium, and would afford a large increase in world energy resources. There was no reason to doubt that within the next 15 to 20 years nuclear energy would make a significant contribution, possibly of 2 to 3 thousand MW to the power requirements.

Lifts for Council Flats

Ingenious Interlocks to combat Malicious Misuse

MULTI-STOREY blocks of flats are a common feature of the post-war housing programme, and an essential part of the electrical equipment of such buildings is a passenger-operated lift. The technical problems involved extend beyond the selection of a suitable lift from a standard range: attention has had to be given to combating the many forms of misuse and malicious damage to which such plant is inevitably exposed. The way in which the London County Council's engineering department has tackled this intricate job is described in a paper by Mr. C. G. L. Morley, A.M.I.E.E., A.M.I.Mech.E., which was read last Thursday before the I.E.E. Utilisation Section.

Design Principles

Accepted practice on the Council's estates is the provision of eight-person lifts with a floor area of 16 sq ft. Such lifts will easily take perambulators. Motor rooms are normally sited at the top of the lift shafts, an arrangement that gives a 40% reduction in load on the building structure as compared with a basement motor room. In the design of motor rooms, special attention is given to the elimination of dust, and to this end conduit is as far as possible sunk in the walls and floor. Another point needing special care is the siting of windows: they should be arranged so that no direct sunlight falls on either the lift mechanism or its associated electrical equipment.

The best method of taking the supply to the lift-motor room is to install the necessary cables in a 13½in. x 4½in. chase running from top to bottom of the associated staircase wall. This chase is also available for the cables serving the flats; wooden cover boards can be provided so that access to the cables is readily available.

Car Materials

Because of the concern about malicious damage, careful thought has to be given to materials and the form in which they are used. For instance, fluted aluminium is used as a car lining, partly because it is more difficult to form rounded ıetters than on a flat surface! It is a basic rule also that no fixing screws for any of the equipment or its accessories should be accessible from the landings or from the interior of the lift car. Solid single-panelled doors, power operated in both opening and closing, are used, both as a safety precaution to protect children and as a safeguard against the wear and damage on mechanical locks that can be caused by door-slamming.

When the lift has reached a landing to which it has been called, both landing and lift doors are opened, and at the same time leads to all landing and car push-buttons are disconnected. Two timing controls are then started. After seconds the car push-buttons are re-connected, the delay prevents the quick reversal of lift travel, which is one form of misuse. After 15 to 20 seconds the feed to the landing push-button circuit is reconnected. The intervening period gives a priority to the intending passenger who has called the lift.

When this second timing device operates, the doors are automatically closed, even though no call has been made. The car is then parked, ready for a call from any landing.

Safety Edge

A sensitive edge is fitted to both car and landing doors, and if this meets an obstruction during closing, a switch is depressed and the direction of rotation of the door-operating motor is automatically reversed. Relays operating the door-motor circuit need to be of light-weight construction, so that on the operation of the motor edge the time-lag in motor-reversal will be as small as possible.

Lift control circuits operate at 100 V d.c. This enables coils of smaller dimensions to be used, and thus smaller relays, and it gives a fair degree of safety against electrical shock hazard.

The car control station consists of a hinged panel secured by two or more locks operated by keys. Push-button assemblies are mounted on a block, and so arranged that when the panel is closed, only the push-buttons project through it. In the locked position, the control panel in turn interlocks a cover extending to the car floor. This covers a junction box in which the trailing flexible cables are conveniently terminated.

Trailing cables extend uninterruptedly from car station to the controller in the motor room, passing through conduit from the top of the lift well to the controller. There is no connection box in the lift well. Trailing cables are anchored about half-way up the well, and near the top, as well as at the bottom of the car.

An important policy decision taken in connection with the operation of these lifts is to remove the emergency stop button normally fitted in lift cars. The reason for this is that it is possible that if the car is stopped by these means, it may be in such a position that the electrical circuit of the landing doors may be opened, but the mechanical lock on them not released. Under these conditions the door-operator motor tries to open the doors, and driving through a slipping clutch fails to do so, and therefore keeps on running. No further action on the part of the passenger can affect this situation.

On consideration it was decided that with this type of lift car, with solid doors, little useful purpose is served by the emergency stop button, and so it is now eliminated. As a corollary to this, a mechanical lock is provided on the car door, so that a passenger cannot open it and so forcibly stop the car.

To provide for inspection of the lift well, which is usually carried out by a mechanic travelling on top of the car, a mechanic's control station is fitted on the roof. A selector switch in this enables the mechanic to obtain complete control of car travel, feeds to all landing push-buttons, etc., being cut off. "Up" and "down" push-buttons are provided, and these will operate the car providing all safety interlocks (e.g., landing door switches) are appropriately set. Release of one of the push-buttons causes the lift to stop immediately. Provision is made for illuminating the roof of the car, and for supplying a lead lamp if this is required.

Lift motor rooms have a circuit-breaker installed in a prominent position near the door, to facilitate prompt action in an emergency. Isolation as required by the I.E.E. Wiring Regulations is made possible by feeding this circuit-breaker through fuses which are housed in a lockable distribution board if several lifts are installed. If there is only one, a switch-fuse is used.

An "alarm" push-button is provided at the car control station, connected to ring a bell mounted near the ground-floor landing door. This bell provides another example of the care necessary to avoid damage. It has had to be modified by having a robust fluted aluminium bell guard fitted. The bell is wired from the lift-motor-room lighting circuit, and is kept separate from other circuits in the roof space.

Time-lags

The sensitive edge on the lift doors has already been mentioned. A common form of misuse is the introduction of foreign matter into the bottom track of the doors, it being impossible to extend the sensitive edge to this position. To prevent the closing motor operating in this condition, with consequent excessive clutch wear, a timing device has been introduced. Should the motor operate continuously for more than one minute, the motor circuit is opened. If a deliberately placed obstruction operates the sensitive edge, the doors may continuously open and reclose. After about two minutes of such cycling, they are held in the fully open position by the operation of another device, and they stay like this until a further call is imposed on the control circuit.

DISCUSSION

R. A. MARRYATT, while welcoming the practical approach of the author to the problems of lifts in workers' dwellings, thought that this special attention to the avoidance of damage was a dreadful price to have to pay for lack of discipline in schools. He went on to suggest that money might be saved by providing only one eight-person lift capable of taking a perambulator, and having other lifts in a block of the four-person type. The author's figures, he thought, showed that this would fulfil the traffic requirements with no difficulty.

With regard to the use of buried conduit in lift motor rooms to avoid dust collection, he thought that there was often some advantage in using metal ducts. It was desirable that mechanics should only ride on the top of lift cars while they were descending.

MR. FORBES JACKSON (L.C.C.) sketched in some background facts about the development of the L.C.C. lifts. He emphasised that since the war the Council had ordered some 1,200 lifts. The only way to solve the problem of manufacture to their requirements was to buy in blocks of a hundred at a time and to store against building requirements. He sometimes wondered if they were going too safety conscious.

MR. F. M. JONES (Senior Architect, City of Birmingham) stressed the value of the paper to an authority which was just entering the field with large blocks of flats. A few lifts were installed in pre-war flats on the basis of, what is the cheapest, and they had never given real satisfaction. From the sociological point of view, the provision of good trouble-free lifts made tenants more willing to dwell in flats. There was a tendency to suggest that lifts should be omitted up

to the fifth floor, but he felt that this should be resisted. The lifts cost only about 5% of the building cost alone of a block of flats.

MR. S. A. GHALIB (M.V.) said that he was no expert on lifts, but spoke as a control engineer. He suggested that lifts might run considerably faster, and that closed loop control systems might be incorporated to keep acceleration and deceleration within comfortable limits. Such methods would give an accuracy of levelling of about ¼ in. rather than the 1 in. which the author claimed.

MR. R. H. LANE (M. of W.) thought that there should be some provision for the ventilation of the lift if it was accidentally stopped between floors. He suggested that one light on the mechanic control station was insufficient, and that there should be a permanent installation of lights in the lift shaft, controlled from the motor room. Safety gear, he maintained, should be tested under actual conditions of operation, to check against the possibility of mechanical weaknesses.

MR. DIXIE made the point that the Ministry of Housing which gave a subsidy for the installation of lifts should encourage their standardisation. There was a case for the preparation of a British Standard for such local authority lifts. He thought, however, that no lift equipment should be standardised without giving serious consideration to American practice.

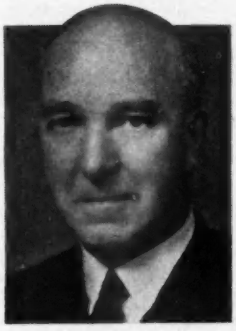
MR. G. WALTERS thought that 100 ft/minute would be rather slow for the 11-storey blocks of flats which were planned.

MR. T. H. L. MILLS considered carbon shoes a great improvement on oil lubricated steel shoes from the point of view of dust conditions. He had one pair of carbon shoes which had been in use for four years, and the only trouble had been slight rusting on the guides due to condensation.

After some other speakers had put questions, the Author replied. He said it was likely that for very tall blocks of flats the Council would install 150 ft/min, and possibly 200 ft/min lifts. The ordering of small lifts for some purposes would be no economy, as the considerable savings brought by standardisation would be lost. With regard to the use of carbon brushes, he thought that these were advantageous under good conditions, but where there was condensation, oiled steel held the advantage. He agreed that there might well be reference to American practice in the preparation of British Standards.

B.E.A.'s New Deputy Chairman

ALL will applaud the choice of the Minister of Fuel and Power in appointing **Mr. Josiah Eccles,** C.B.E., M.M., B.SC., M.I.E.E., M.INST.C.E., M.I.MECH.E., as deputy chairman (operations) of the British Electricity Authority, in succession to **Sir John Hacking,** who is retiring, as we have already noted. Mr. Eccles has all the qualities of professional eminence and personal charm which the many important posts he has held demand. His quiet, unassuming manner conceals a wealth of knowledge and valuable experience accumulated during over 30 years' service in the Industry.



Mr. Josiah Eccles

An Ulsterman by birth and upbringing, Mr. Eccles was educated at Queen's University, Belfast, where he graduated with first-class honours in 1922, after war service in the course of which he gained the Military Medal.

He then joined the Metropolitan-Vickers Electrical Co., and ultimately became assistant constructional engineer for Scotland. It was in 1928 that he entered the Supply Industry, going to the Edinburgh Corporation Electricity Supply Department as senior technical assistant, and later held positions as generation engineer and deputy manager. Consequent on a breakdown in the health of Mr. E. Seddon, the then chief, Mr. Eccles was appointed joint engineer and manager in April 1939, and in August 1940, on the retirement of Mr. Seddon, he assumed sole responsibility for the undertaking. In addition, he figured prominently in the good work of the I.M.E.A., the Scottish Centre of the I.E.E., and the Royal Scottish Society of Arts. It was in January 1944 that he took up the post of city electrical engineer and manager at Liverpool, succeeding the late Mr. P. J. Robinson.

Following the introduction of the Electricity Bill, Mr. Eccles was nominated a member of the Organising Committee set up by the Minister of Fuel and Power to make the necessary plans and preparations for nationalising the Electricity Supply Industry.

Subsequently he was appointed chairman of the Merseyside and North Wales Electricity Board, with a seat on the British Electricity Authority. To Mr. Eccles also fell the honour of being the last of a long list of distinguished presidents of the Incorporated Municipal Electrical Association, holding office in its final year, 1947/8. In the latter year he also became chairman of the newly consituted Council of E.D.A. He has been a vice-president of the I.E.E. since 1949. Over many years he has contributed numerous papers to various organisations, ranging from "The Management of an Electricity Supply Undertaking" before the I.M.E.A., to discourses on engineering tools.

Air-Break Circuit-Breakers

TWO AMERICAN TYPES DISCUSSED IN E.R.A. REPORT

SETTING out to review available information on air-break, arc chute circuit-breakers of the type in which the arc chute is constructed of a non-gas-forming material, a recent E.R.A. report (G/XT135) provides a useful summary of both the development of this breaker and analyses of its performance.

Initially, however, the report attempts to remove ambiguity of terminology associated with air-break breakers, as names such as "magne-blast," "magnetic blast" and "magnetic de-ion" have been used not only to describe particular breakers but as type designations. Since the first is, in fact, a trade name whilst "de-ion" was introduced to describe a multi-gap, copper-plate breaker, the report adheres to "air-break, arc chute" throughout. This refers to breakers in which an arc, first drawn between suitable arcing contacts, is forced into a somewhat elaborate arc chute formed of non-gas-forming material.

Interrupting A.C. and D.C.

In discussing the difference between the interruption of d.c. and a.c. circuits, the need for a slow rate of current fall is common to both; for d.c. breaking, however, the assumption of a negative v/i characteristic may only hold good for small currents. Breaking a.c. may also be carried out rapidly, but this is only permissible at the point of current zero in the cycle.

Both classes of operation are combined in two breakers—the plain-break oil immersed type, and the air-break arc chute type. Arc resistance rises rapidly at current zero, but usually not to a value high enough for interruption. Hence for successful operation the resistance must continue to rise during the first few degrees of the following half cycle until effectively an open circuit.

However, the voltage waveform across an opening breaker, when a sinusoidal current is flowing, has been chosen as the basis for a simple classification, there being three basic types. The arc chute air breaker falls into the third group, its voltage rising at the beginning of the half cycle and remaining constant, only falling at the end. The rate of rise of the voltage is less than the natural r.r.r.v. of the circuit, indicating the existence of considerable conductivity during this period.

The report traces briefly the history of air-break c.b.s. up to 1939, when Ludwig and Grissinger, of the Westinghouse Electric and Manufacturing Co., described a breaker having a rupturing capacity of 270 MVA at 750 V. The construction and operation of the breaker is described, together with that of the American G.E. Co., an air-break unit of 100 MVA rupturing capacity at 5 kV. This was also introduced in 1939, and reported by Boehne and Linde. Further air-break arc chute breakers developed by the two companies are described, these culminating in 15 kV units having a capacity of 500 MVA.

Whilst successive breakers are seen to differ largely in detail, among notable developments in this advance is the incorporation of an air-puff device, which first made its appearance in the G.E. Co.'s breaker in 1944. A piston, connected to the moving contact arm, was so arranged to direct a "puff" of air perpendicular to arc to drive it into the chute, in order to clear low current arcs more successfully. Another interesting development was that of the use of heavy copper shading rings around the magnetic circuit, employed on the Westinghouse breaker introduced in 1946. Its presence introduced a lag of 30° in the magnetic field whilst extra turns were added to obtain higher field strengths.

Analysis of Information

Information given on each breaker is briefly analysed, discussing the effects on r.r.r.v., arc chute power dissipation, interrupting capacity and material, and other features. Results of tests carried out on the arc extinction properties of slots and plates by Browne and Strom, Slepian, Babakov and other tests are also discussed briefly.

The report concludes that, although breakers of this type have been successfully constructed up to the largest size mentioned, and appear to equal oil breakers in certain respects, the arc extinguishing process has not yet been directly determined. In this respect, the work of Browne and Strom gives a firm indication, showing that for small-scale tests at least, the mechanism is of the energy balance type. Energy loss from the arc column during and immediately after current zero has therefore to be greater than the input energy for successful interruption.

PROBLEMS AND PRACTICE in Engineering

Cable Fault Location and C.T.'s

IT is patent from the comments in your issue of November 26 that Mr. Ogden associates my views on isolation entirely with the incidents featured in his original letter. There are, of course, more cogent reasons for my observations but, previously, these were irrelevant to the theme of this correspondence. The situation now is somewhat different and, perhaps, permits of explanations.

Having regard to their characteristics, it is illogical to entrust operational security to current transformers but practical considerations frequently render this inevitable. The element of risk which they introduce is further increased where the continuity of the secondaries depends upon the intimacy of the contacts constituting the auxiliary isolating media.

Personal experience suggests that distrust of these contacts is well-founded and that the tendency in circuit-breaker design is to confine them solely to auxiliary circuits in which the consequences of discontinuity in service are less serious.—*"1066"*

Misleading Name-plate

THE local corn mill while still mainly dependent on the old water wheel, had, some years ago, bowed to progress in installing a 12 h.p. s.c. motor to drive the drying kiln fan or tailing machine, as required.

Recently this motor failed and another local firm lent them an obviously unused 13 h.p. machine until their own was rewound. This motor, of Continental origin, was checked for voltage, frequency, etc., and the name-plate clearly showed star/delta, 380 V, which suited the power supply. The motor terminals were marked U, V, W, and X, Y, Z, while the manual switch, of well-known British manufacture, had the usual A, B, C, etc. A check with the Megger showed it was simply a matter of calling U, A; V, B; W, C; and so on.

After connecting up, the motor, with the belt off, was tried in star when it reached full speed promptly and in the right direction but on switching over to delta the motor "roared" and the switch tripped. Crossed leads were suspected but on cnecking were found to be correct. The switch, an air brake pattern with thermal releases in all 3 phases, was re-examined. Two of the terminals which had already received attention as showing definite signs of overheating and probably the cause of the original motor burning out, were again checked and all contacts dressed. Everything appearing to be in order, the motor was again tried but again the same results were obtained.

The miller was obviously very disturbed by now. He was already 24 hours without a motor and the chances of getting another one within a reasonable time were very remote. What with having no ammeter to check the current and finding no visible reason for the trouble there was some cause for his assuming a despondent outlook.

Luckily, in this case, the starter handle was not interlocked with the door, neither was the mechanism of the "free-latch" type. With the cover open and watching the "innards" carefully the switch was put into the start position and held there for a time. As usual everything appeared normal and the motor rushed up to speed almost instantaneously, this in itself was significant. On switching over to the run position the handle was held in by hand when all three releases were seen to heat up immediately and were about to glow when the handle was released.

The only conclusion to be drawn was that the motor was incorrectly rated and should read star 380 V and not star/delta 380 V. To test this the belt was put on for the bigger load (the kiln fan) and the starter switched to star and held there. The motor rushed up to speed and pulled the load for about half an hour without distress or heating.

It was then wired for direct starting by putting the "star" on the motor and using three leads, the blocking piece being removed so that the handle could be switched directly into the run position. The motor worked satisfactorily for three weeks until the original motor was received ready for use from the rewinders.—*C. Byrne.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Problems of a practical nature to which a solution is required will also be considered. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

overseas news

Another Alberta Station?

A proposed steam power plant, estimated to cost $8 million, which Calgary Power Ltd., of Alberta, is considering for Lake Wabamun, 55 miles west of Edmonton, may be started next year. When completed this will be the largest steam station in Alberta. A decision on the project is expected soon. The company now has three power projects under construction. One is a steam plant, using natural gas, at Medicine Hat, scheduled for completion this month; another, a 67,450 h.p hydro plant at Ghost River, west of Calgary, to be completed in 1954; the third, the Bearspaw dam project, at Calgary, which will add another 22,000 h.p. in 1955.

Results from Quebec

The Quebec Hydro Electric Commission reports a total revenue of $45,756,607 for the operation of its Montreal system during 1952, it is shown in the annual report just published. Electricity sales increased by 7¼%, and the number of consumers connected rose by 13,085 to a total of 412,712. Commissioner J. M. McCammon, general manager of Quebec Hydro, states that growth in the number of consumers was above expectations. Consumption of electricity by domestic consumers had increased in the past seven years from an average of 980 units in 1946 to 2,085 units in 1952. This growth was due in a substantial degree to the use of appliances such as large water heaters and space heaters, he adds.

Plan for N.S. Steam Station

Establishment of a $2,000,000 coal-burning steam electric power plant in the Port Hood district of Nova Scotia has been proposed by the British Coal Co., a concern which is also seeking a $1,000,000 loan from the Dominion Coal Board to develop coal resources in Inverness County. The British Coal Co., a subsidiary of Margaree Steamship Co., some months ago applied to the Coal Board for a loan to enable it to proceed with mechanisation of its mines. In putting forward this new plan, it states that whether this plant is established by the coal operators at pit mouth, at Inverness or Port Hood, or erected by the Nova Scotia Power Commission, at a point near the Strait of Canso, it would in any case furnish substantial additional market for Inverness coal.

Poland Needs Appliances

The output of electrical apparatus such as flexes, switches, plugs, etc., in Poland, must be increased, according to Boleslaw Bieruk's report to the recent meeting of the Polish United Workers' Party Central Committee. He stressed that although production of consumer goods had almost doubled by the end of the fourth year of the Six-Year Plan, output of many items was still insufficient. He stressed that the production of such goods as vacuum cleaners, floor polishers, electric refrigerators and washing machines should be increased considerably. In fact, he urged a rapid and radical change in the production of all types of metal goods.

Too Much H.P.

South African retailers of radio and electrical appliances have been warned that conditions in the trade indicated a return to a buyers' market and that only the business which provided service and quality would succeed. The warning was given recently by Mr. D. de Waal-Meyer, the South African Secretary for Commerce and Industries, when addressing the first national convention of the Radio, Refrigeration and Electrical Appliance Association, in Johannesburg. Pointing out that Mr. E. Louw, the Minister for Economic Affairs, had said that it might be necessary to apply controls to the sale of luxury electrical products, Mr. Waal-Meyer maintained that there had been some inducing of people to buy beyond their means in the hire purchase market. The Minister intended to amend the Act covering that type of buying so that he could decide what percentage the deposit would be and the period of repayment. Expensive radios had been found in homes where people could not afford even to pay the economic rent, he said. He warned the retailers that if they overdid the Hire Purchase Act, it would ricochet back at them—the Minister would take the steps he had threatened.

Institute's Building

The new buildings of the Central Indian Institute of Engineers in New Delhi was officially opened a few days ago by President Rajendra Prasad. The Institute, which is 33 years old, has its headquarters in Calcutta, and has 11 regional centres. At the ceremony, the President said he was glad that instead of waiting for some large donor or the Government to make the necessary funds available for building the Institute, they had themselves raised a magnificent structure by their own efforts.

Expansion in Queensland

Since April, 1952, the State Electricity Commission of Queensland had raised about £4,250,000 from public loans in the State, the Mines Minister, Mr. Riordan, has stated. This money was being used for electrical development in Regional Electricity Board

areas throughout the State, he said. Mr. Riordan was speaking at Blackbutt, in the Wide Bay-Burnett electricity district, where he switched on an electricity supply for the township. The Wide Bay-Burnett region covers about 16,000 sq miles. During the last financial year, over 311 miles of line had been constructed there. Estimated cost of all works now in hand was £5,162,000, of which £2,485,496 had been spent to June 30, 1953.

Another H.E. Scheme

A proposed hydro-electric project near Ouse would entail the flooding of about 342 acres of farmland, Mr. Cosgrove, the Tasmanian Premier stated recently. He referred to the report of Mr. Knight, Hydro-Electric Commissioner of Tasmania, in which it was said that in the course of inquiries into the proposed renewal of Dunrobin Bridge, the Parliamentary Public Works Committee had asked what effect a hydro-electric scheme, undertaken at a later date, would have on the bridge and the adjacent area. Mr. Knight had stated that it would be desirable to raise the level of the bridge. By constructing a dam across the Derwent, about 10 miles down-stream from Ouse township, it would be possible to develop about 40,000 h.p. The Hydro-Electric Commission did not propose to recommend the construction of the scheme at present, but it might be undertaken later, subject to parliamentary approval.

Victoria Wants to Go Ahead

An appeal to the Federal Government to permit the State Electricity Commission of Victoria to go ahead with its Morwell project, was made by Mr. Galbally, Minister for Electrical Undertaking, recently. He said they had the materials and the men. All that was needed was a bold optimistic outlook at Canberra. The State Electricity Commission was now in a sound financial position, and some money could be found to begin work at Morwell immediately, he said. But only the Federal Government could give the assurance of finance to ensure an uninterrupted £20 million works programme. He pointed out that equipment worth about £15 million was in storage at Morwell and costing the Commission £1 million a year in interest. If the plant were working it would be earning money to meet that interest and pay the capital charges.

Geothermal Station Site

A site has been selected for a geothermal power station on the bank of the Waikato River near Wairakei, Mr. Goosman, the New Zealand Minister of Works, told the House of Representatives recently. Mr. B. Wood, chief development engineer of Merz and McLellan, the consulting engineers, has returned to Britain to proceed with the plans for the plant, he added, when introducing the second reading debate on the Geothermal Energy Bill. This Bill consolidates and extends last year's Geothermal Steam Act which vested in the Crown all rights to generate electricity only from geothermal steam. This new Bill vests in the Crown the sole right to tap, take, use and apply geothermal energy for every purpose. Mr. Wood told the N.Z. Government that the mineral content of the Wairakei geothermal steam was only 1/40th of that encountered at Lardarello, in Italy. He did not expect much trouble from corrosion, and normal turbines and generators could be used. From two 8-inch bores at Wairakei he estimated that 60 MW could be generated at a cost lower than that of a hydro-electric station. By siting the first station on the banks of the Waikato River there would be a saving of £50,000 a year. During the debate, Mr. Goosman stated that on a present 8-in. bore, a 5-in. diameter valve wide open, had a pressure under it of 290 lb/sq in. Engineers estimated that the full pressure would go up to 700 or 800 lb/sq in. There was no way of measuring the extent of the steam supplies, he continued, but it was improbable that any amount likely to be drawn off would affect future supplies. Some of the bores had been down at Wairakei for three years, and, if anything, they had improved. The consultants are to make a full report to the Government.

Six Months' Progress

Total income of the Thames Valley Electric Power Board for the six months ended September 30 last was £246,604, the secretary-treasurer, Mr. A. E. Ross, has reported. The excess over expenditure amounted to £24,014. Units sold during the period totalled 51·3 million, an increase of 26·4% above the corresponding months in 1952, and a further 115 new consumers were connected.

Five Year Programme for Japan

Under a five-year electric power development programme, to be completed by the end of the fiscal year 1957-58, and designed to assure a balanced supply of electric power in Japan, the sum of Yen 807,154 million is to be spent on the expansion of power-generating facilities, both thermal and hydro-electric, including transmission depots and other installations. In the final year of this scheme, productive capacity is to be increased by 5,123 MW. In the first part of the programme, Yen 165,800 million will be invested in power works now already under construction and in new projects to be started in the current financial year in an effort to raise output by 1,249,785 kW. The projected investments will, in part, be financed from abroad. The Electric Power Development Regulatory Council has revised its estimates made earlier after surveying Japan's industrial and business activity. It is now estimated that additional facilities capable of taking the peak load of 5,100 MW (3,700 MW hydro-electric and 14,000 MW thermal) should be built so as to increase Japan's capacity in the final year of the plan to the neighbourhood of 16,000 MW, of which 11,000 MW would be from hydro-electric stations.

PERSONALITIES IN THE INDUSTRY

Nominated as the four Area Board Chairmen to serve on the Central Authority from January 1 next are : **Mr. H. J. Randall,** C.B.E., F.C.I.S., comp.I.E.E. (chairman, London Electricity Board); **Alderman W. S. Lewis,** C.B.E., J.P., comp.I.E.E. (chairman, Midlands Electricity Board); **Mr. D. Bellamy,** O.B.E., D.L., F.A.C.C.A., F.C.W.A., comp. I.E.E., F.R.Econ.S., F.S.S. (chairman, Yorkshire Electricity Board); and **Sir Joseph Hallsworth,** M.A. (chairman, North Western Electricity Board). They will take over from four other Area Board Chairmen, **Mr. C. T. Melling** (Eastern Board), **Mr. H. H. Mullens** (North Eastern Board), **Mr. H. Nimmo** (Southern Board) and **Mr. S. F. Steward** (South Western Board).

Professor N. F. Mott, F.R.S., has been nominated to succeed **Sir Laurence Bragg** in the Cavendish Chair of Experimental Physics at Cambridge University. Sir Laurence has held that office for the past 15 years. Dr. Mott has been Professor of Physics and director of the Henry Herbert Wills physical laboratories at Bristol University since 1948.

We hear that **Mr. H. F. Carpenter,** F.C.I.S., F.S.A.A., who recently retired from the position of secretary of the British Electricity Authority, has been appointed first chairman of the Electricity Authority of Cyprus, which has been formed to co-ordinate electricity supplies in that island.

Mr. W. G. Thomas, M.Inst.F., has been elected a director of Radiovisor Parent Ltd. He is also managing director of Bailey Meters and Controls Ltd., and chairman of the British Industrial Measuring and Control Apparatus Manufacturers' Association.

Two new appointments at their Bootle Works are announced by the Liverpool Electric Cable Co., Ltd. They concern **Mr. J. R. Cox,** M.I.E.E., who has been appointed chief engineer and manager, and **Mr. G. T. Richards,** A.M.I.E.E., who now becomes works manager. Previously, Mr. Cox held the position of technical engineer, and Mr. Richards was the assistant works manager.

Mr. J. R. Cox

The Minister of Fuel and Power has re-appointed **Miss N. Kenyon, Mr. M. L. Haselden,** B.A., and **Alderman H. E. Rhodes,** J.P., as part-time members of the North Western Electricity Board.

Mr. R. A. Erskine, M.A., M.I.E.E., chairman and managing director of Erskine, Heap and Co., Ltd., plans to leave Britain by Comet on January 24 for a seven weeks' tour of Uganda, Kenya, Tanganyika, Northern and Southern Rhodesia and the Union of South Africa. Mr. Erskine is to visit the firm's agents in those areas and also to meet existing and new customers. In recent years he has made many business trips abroad to various countries.

Mr. R. A. Erskine

From Santon Ltd., we hear that **Mr. J. R. Greenfield** has been appointed additional sales representative for the Midland area, and will be attached to their Birmingham branch at 54 Pershore Street. Prior to this appointment Mr. Greenfield was with the Midland Electricity Board, in Walsall.

Sir Arthur Croft has decided to retire from the positions of managing director of Crofts (Engineers (Holdings) and Crofts (Engineers). He will remain chairman of both companies. The deputy chairman of the holding company, **Mr. J. A. Croft** becomes managing director, and two additional directors, **Mr. M. Goff** and **Mr. H. Matthews,** have joined the Board. Mr. J. A. Croft also becomes deputy chairman of Crofts (Engineers), and Mr. Goff and Mr. Matthews have been appointed joint managing directors.

We are now able to reproduce the photographs of **Mr. W. A. Shaw,** Assoc.I.E.E., and **Mr. H. W. Griffiths,** A.M.I.E.E., M.S.M.A., M.I.Ex., whose appointments with Evershed and Vignoles, Ltd., as sales director and a member of the board, and general sales manager respectively, we noted last week.

Mr. W. A. Shaw

Mr. H. W. Griffiths

Col. N. Hudson

Mr. J. E. Sherlock

In view of the increased activities of the British Thermostat Co., Ltd., **Colonel Noel Hudson,** D.S.O., M.I.Mech.E., M.I.E.E., has asked to be relieved of the duties and responsibilities of chairman. Colonel Hudson remains a director and continues his executive duties. **Mr. J. E. Sherlock,** the managing director, has been appointed chairman.

Two new district managers have been appointed by the South Eastern Electricity Board, with effect from February 1 next. For the Horsham district, the new manager will be **Mr. L. J. Simmons,** M.I.E.E., A.M.I.I.A., who is now senior assistant engineer, construction, operation and maintenance, at the Board's Mid-Sussex sub-area headquarters. Appointed as manager of the Woking district is **Mr. S. C. Poole,** A.M.I.E.E., who is at present senior assistant engineer, planning, at the headquarters of the Board's Surrey sub-area. Prior to vesting day he was for many years mains engineer at Surbiton to the former London and Home Counties J.E.A.

At last Thursday's session of the British Electricity Authority, attended by **Sir John Hacking** for the last time as deputy chairman (operations), the Authority passed the following resolution:—"That on the retirement on December 16, 1953, of Sir John Hacking, M.I.E.E. from the office of deputy chairman (operations), the Authority record their profound appreciation of his devoted and eminent services unsparingly given to the Electricity Supply Industry, and acknowledge their deep sense of gratitude to him for the wisdom, generosity of spirit, breadth of mind and guiding influence with which he has enriched their counsels; and, that the Chairman and Members of the Authority, in association with the Chairmen of the Area Electricity Boards and the Principal Officers of the Authority, in paying tribute to the zeal, skill, foresight and understanding which Sir John has brought to the high offices which he has held during his notable career, extend to him and to Lady Hacking every fond and sincere wish for their future health and happiness."

Dr. E. D. Adrian, O.M., has been elected president of the Royal Society for the ensuing year.

Our accompanying illustration shows Mrs. Melling, wife of the president of the A.S.E.E., presenting a gold engraved wristwatch to **Mr. P. A. Thorogood,** in recognition of his work in organising the 1953 Electrical Engineers Exhibition at Earls Court.

Mr. Thorogood receives his gold watch

Mr. B. C. Pyle, A.M.I.E.E., senior assistant engineer (Generation Construction Department) of the Southern Division of the B.E.A., has been appointed generation engineer (construction) in that Division. He succeeds **Mr. C. W. A. Priest,** B.Sc. (Eng.), A.M.I.Mech.E., M.I.E.E., whose appointment as chief generation engineer (construction) of the South Wales Division we have already noted. Mr. Pyle received his technical education at Portsmouth Municipal College and was a student engineer with the Portsmouth Electricity Service. He then served with the Sheffield Corporation Electricity Department as junior technical assistant, returning to Portsmouth as technical assistant (electrical). With the reorganisation of the industry in 1948, Mr. Pyle became personal assistant to the Controller of the Southern Division, and a year afterwards was appointed to his present post.

At present the Bristol Branch manager for Enfield Cables Ltd., **Mr. H. R. Beasant,** M.I.E.E., has been appointed liaison engineer for the South and South West of England and Wales. As from January 1 next, his particular duties will be the negotiation of contracts for the supply and installation of cables in conjunction with the Enfield Contract Department. His position as branch manager at Bristol is to be filled by **Mr. G. N. Charters,** who joined Enfield's in 1951 as a Devon and Cornwall area representative.

Mr. H. R. Beasant

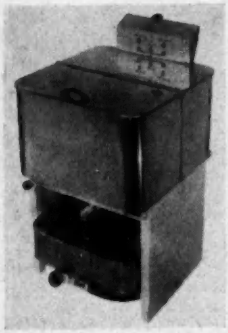
OBITUARY

Mr. R. A. Pantlin, a director of the General Cable Manufacturing Co., Ltd., and a number of their concerns, died on December 9, aged 68.

The BUYER'S *Column*

New Kent Dish Washer

A NEW model of the Kent dish washing machine is to be introduced at the forthcoming Hotel and Catering Exhibition.



Kent's new model is for 100 meals per hour catering establishments

The makers, MAX ARC AND ELECTRICS LTD., Terrace Road, Walton-on-Thames, say that it is designed for catering establishments handling up to approximately 100 meals per hour and is completely self-contained, incorporating reservoir tanks, immersion heaters, and water pressure pump. It is especially suitable where space is limited and the installation is quite simple.

H.M.V. Price Reductions

AS from yesterday (December 16) a number of domestic appliances made by H.M.V. Household Appliances, Hayes, Middlesex, will be considerably reduced in price.

A rebate plan for distributors and wholesalers for these appliances will operate in connection with these reductions including a rebate of purchase tax where applicable.

Hair dryer from £8 12s. incl. tax to £6 4s. 3d.
Horizontal toaster from £4 12s. 6d. no tax to £3 10s.
Upright toaster from £4 4s. no tax to £3\
Portman fire 1 kW from £6 12s. 6d. incl. tax to £4 16s. 10d.
Portman fire, 2 kW, from £8 5s. incl. tax to £6 7s. 9d.
Welbeck fire, 1 kW, from £7 10s. incl. tax to £5 12s. 4d.
Welbeck fire, 2 kW, from £9 5s. incl. tax to £7 3s. 3d.
A.C. heat controlled iron from £3 7s. 6d. no tax to £2 5s.
A.C.-D.C. heat controlled iron from £3 12s. 6d. no tax to £2 10s.
A.C. heavy duty iron from £3 17s. 6d. no tax to £2 10s.
A.C.-D.C. heavy duty iron from £4 2s. 6d. no tax to £2 15s.
Iron stand from 8s. 6d. no tax to 5s. 6d.
Cavendish room heater from £16 13s. 6d. incl. tax to £13 0s. 2d.

Fire guards to comply with the recent Government regulations will be provided.

Livestock Care and Control

AN illustrated descriptive list issued by the COOPER-STEWART ENGINEERING CO. LTD., 4 Vernon Place, London, W.C.1, brings to our notice the electric appliances for agricultural purposes which they produce.

The "Hornmaster" de-horner is an electrically heated searing iron which is quick and humane. The new pattern has a shaped wooden grip and operates from a transformer which is metal cased.

There are four electric clipper models powered by ¼ h.p. motors of the hanging type and the other portable models.

Another item is the Model CX102 electric animal coaxer which, powered by standard torch type dry cells, produces a shock which is powerful but harmless and will, it is said, cause the most obstinate animal to move.

Sales Aids for "Dimma" Switches

THE "Dimma" 3 light switch made in two ranges Cat. No. DD 101 25w-60w and Cat. No. DD 102 75w-100w, is now supplied in a new twelve unit pack, attractively designed and printed in pink and black. It serves as an eye-catching point of sale display, easily erected into

Pink and black are the colours of this "Dimma" pack

a sturdy dispenser for counter sales. The list price for both types of switch is 19s. 6d. each. These are available from Electrothermal Engineering, Ltd., 270 Neville Road, E.7.

Benjamin's Reflector Cleaner

IMPRESSED by figures of dirt deposition in our towns and concerned at the effect of this depositing on lamps and lighting fittings BENJAMIN ELECTRIC LTD., Brantwood Road, Tottenham, London, N.17, have now marketed a "Benjamin Reflector Cleaner." This is sold in air tight

1¼ lb tins at 4s per tin list price. It is similar to the current paste type grease solving detergents but in addition to making the cleaning of reflector surfaces, whether glass or vitreous enamel, anodised aluminium or plastic, it also leaves a conducting layer on plastic surfaces which prevents the collection of static electricity which would rapidly attract fresh dirt and dust.

B.T.H. Industrial Fittings Range

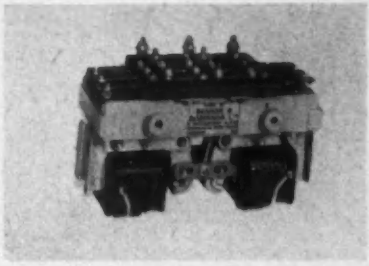
FOLLOWING the Mazda "Monolux" bare-lamp fitting, THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, London, W.C.2, have announced a complete new range of industrial fittings with Fixed B.C. Lampholders and the "Pendicone" suspension principle. The former permit instant re-lamping with either hand from either end of the fitting. The "Pendicone" method greatly simplifies installation.

The new range consists of standard one and two-lamp channels fully wired with either "Switch Start" or "Instant Start" control gear, together with channel covers to form bare-lamp fittings.

Reflectors are available to form a complete range of industrial fittings. They include open or closed ended, with or without upward light, in stove or vitreous enamel, and open or closed ended "Perspex" and the anodised aluminium angle version.

A new enclosed type "Perspex" diffuser fitting is suspended, in one piece, from the basic channel. It will hinge from either side of the channel for rapid re-lamping or can be easily disengaged.

The chokes are Instant Start transformers of the familiar BTH "brick" type heavily encased in cast iron and without any form of compound filling. "Permitol" capacitors only are used.



Besson & Robinson's reversing contactor

A Reversing Contact

ILLUSTRATED above is a robust compact reversing contactor introduced by BESSON AND ROBINSON LTD., Government Buildings, Kidbrooke Park Road, London, S.E.3, sole selling agents being Oliver Pell Control Ltd., Cambridge Row, Woolwich, S.E.18.

It has a positive mechanical interlocking, measures only 3 in.×5⅞ in.×4 in. and can be used to switch on and reverse single or three phase motors up to about one h.p. It is made to the highest possible standards of quality, has a fully tropical finished "Oilite" bearings, stainless steel hinge pins, fine silver contacts and their patented armature shading arrangement which gives inherently buzz-free operation.

TRADE PUBLICATIONS

CONTROL GEAR.—Allen West and Co. Ltd., Brighton 7, Sussex, have issued as a booklet a reprint of their pages in the second edition of BEAMA catalogue.

TELEVISION AERIALS.—A complete catalogue is available of Aerialite radio and television aerials. It is available from Aerialite Ltd., Castle Works, Stalybridge, Cheshire.

REFRIGERATION.—A recent publication L.192 by the Pressed Steel Co. Ltd., Oxford, is a broadsheet covering Prestcold refrigeration for the meat trades.

WELDING.—The first issue of a technical bulletin "Mechanised Welding News" has been produced by Fusarc Ltd. of Gateshead-on-Tyne. This replaces the production News Sheets hitherto issued

VACUUM EQUIPMENT.—Brochures on the following types of high vacuum equipment are available from W. Edwards and Co. (London) Ltd., Manor Royal, Crawley, Sussex. They deal with rotary pumps, moisture and mercury vapour lamps, and vacuum cooling plant.

DOMESTIC EQUIPMENT.—English Electric Co. Ltd., Marconi House, Strand, W.C.2, have now issued additional material for inclusion in copies of their Demonstrator's Bulletin. This new material concerns the company's washing machine with immersion heater and rotary ironer.

MOTORS AND EQUIPMENT.—A special issue of the L.S.E. Engineering Bulletin has been published by Laurence, Scott and Electromotors Ltd., Gothic Works, Norwich. It is published during the Company's 70th year of motor manufacture. Extra copies have been reserved for college lecturers since it gives a comprehensive outline of the main industrial types of electric motors and their applications and will be in great demand.

DOMESTIC EQUIPMENT.—Details of Hoover Ltd.'s plans for Christmas advertising have been announced in a colourful brochure. It shows the showcards, streamers and "gift" leaflets available to dealers.

LIGHTING.—Planned shop lighting and floodlighting are the subjects of two of the new style broadsheets issued by Siemens Electric Lamps and Supplies Ltd., 38 and 39, Upper Thames St., London, E.C.4.

REFRIGERATION.—A four language brochure has been issued by the Danfoss Manufacturing Company, Nordborg, Denmark, describing their range of automatic controls for refrigeration.

The WEEK in NEWS

N.W. Board may extend Stamps Scheme

Private Traders may be asked to Co-operate

THE stamps scheme introduced by the N. Western Electricity Board in June 1952 has proved so successful that the Area's Consultative Council is anxious to extend the system still further. The scheme entails the sale of "savings" stamps to consumers in order to provide convenient means for settling the electricity bill at the end of each quarter. The stamps are valued at 2s. 6d., may be bought at any time at any service centre, and then submitted on cards in settlement, or part settlement, of accounts. Sales are understood now to be in excess of £100,000 a year, which is big proof of the scheme's popularity, but the Consultative Council considers there are still a large number of consumers who do not know about it.

We understand that among ideas discussed by the Council was that of making the stamps available at the shops of selected private electrical contractors. It is also suggested that meter readers could be instructed to publicise the scheme on their visits.

This system of "savings" was introduced as an experiment in 13 of the Board's service centres in the Lake District to begin with. After the 6-month trial it was extended to a further 16 service centres, and then throughout the Board's Area last February. At that time only Manchester was excluded.

New Rates for Trainee Demonstrators

A SPECIAL salary scale for trainee demonstrators in the electricity supply industry has now been agreed upon. The scale starts at £144 per annum, and rises by thirteen steps to a maximum of £360. Entry to the scale is dependent on the qualifications and experience of the trainee, and increments will be granted annually subject to satisfactory service, while the Area Boards may, at their discretion, grant accelerated increments.

Hitherto, trainee demonstrators have been appointed on the general clerical scale. This rigid tying to age has not, however, proved satisfactory, in view of the varied sources of recruitment of demonstrating staff and to the differing periods of training involved.

DOLLAR CONTRACT

WE note another sizeable dollar contract has been secured by a British company. Aluminium Wire and Cable Co. Ltd. announced last week that they are to supply steel-cored aluminium conductors to the British Columbia Electric Railway Co. Ltd. Delivery will be affected in the early part of next year. Value of the order is stated to be about $750,000.

WORKS MANAGER FOR CALDER HALL?

THE Minister of Supply has indicated that advertisements will be placed shortly for the appointment of a works manager at the new atomic power station being built at Calder Hall, Cumberland. The position will carry with it a salary of £2,000 a year. This is in accordance with the scale for works managers under the Civil Service list although the successful candidate will probably be transferred to the Atomic Energy Corporation. The person appointed will probably have to spend about eighteen months gaining experience. The station is expected to be completed in about two years' time.

Wiring in Cinemas

ANNUAL inspection of cinemas in Buckinghamshire has shown that many need to pay urgent attention to electrical wiring, the County Council was told at their recent meeting. In future, therefore, cinema licencees will have to submit a certificate signed by a qualified electrician, every three years.

The First Half-Century

On Thursday we assembled to commemorate Dr. Gilbert of Colchester, who died that day 300 years ago, and to present to his native borough a picture by Mr. Acland Hunt of the doctor showing his electrical equipments to Queen Elizabeth. Dr. Silvanus Thompson said that for us Gilbert was pre-eminent in his time, a time of great men. But there had been statesmen before Cecil, dramatists before Shakespeare and explorers before Raleigh; before Gilbert there had been no electrician. He had in his hand a copy of Gilbert's treaty, De Magnete, with Gilbert's own annotations in the margin. He also showed us a 'terrella,' or small globe of loadstone, with which Gilbert had investigated the magnetic dip and inferred that the earth was a magnet. Colchester, he said, should be the Mecca of all devout electricians.—*From our issue of December* 17, 1903.

PUBLICITY FOR GOVT. ADVICE FOR EXPORTERS

ABOUT 50,000 individual manufacturers have this week received a letter from Mr. D. Heathcoat Amory, Minister of State at the Board of Trade, pointing out the various ways in which firms can seek the aid of Government services in expanding export trade. It has become apparent during the past year or so that many manufacturers do not know that there is help available, and consequently the Board of Trade has been considering ways of publicising their services. A personal approach was decided upon. The letter is accompanied by an explanatory leaflet and a reply card. Reason for this move is aptly summarised in Mr. Amory's letter which states that he wants to be sure there is no firm which could export, or could export more, which is failing to do so.

At the same time, we hear that the Export Credits Guarantee Dept. has created a new post; that of press and publicity officer. Mr. P. Jones has been appointed to the position.

£164,000 Minimum to Electrify Scottish Borders

EACH Consultative Council continues to wage its own little battle for an increase in the permitted expenditure on rural electrification. Latest phase in the battle of the S.E. Scotland Council is that their plea for £164,000 during 1954-55 for the Border area is not being received too well. The council maintain that the sum should be regarded as a minimum rather than a maximum. It is emphasised that the district concerned had no industry to assist in attracting electricity as had the other sub-areas, with the result that the southern sub-area was gradually becoming depopulated through lack of amenities. The Board has stated that the request could not be considered until all the requirements of other sub-areas had been debated. At present it seemed the £164,000 (compared with £115,000 last year) could only be granted at the expense of the Fife, Central and Lothians sub-areas.

Total number of farms in the southern sub-area is 6,062, of which 2,400 have electricity. About 600 of the balance are inaccessible hill farms. To provide all 3,000 with electricity would cost about £4 million, but in 15 years it is calculated that revenue would be £15 m. The Consultative Council have stated that they are prepared to meet the Minister of Fuel and Power, if necessary, to try to obtain special consideration for development in the area.

Electricity Polls 485 —Only 9 vote Gas

BY 485 votes to 9 council tenants at Irvine (Ayrshire) favoured cooking by electricity. It may not have been a fair "by-election," but we understand the Electricity Board only knew about it at the last minute. It appears that Irvine town council intimated to their 494 tenants that as the electric cookers had reached the end of their usual life, they proposed by arrangement with the Scottish Gas Board to supply new gas cookers. Tenants would be charged 1s. per week for maintenance under the arrangement; but they were also told that if any chose to instal a new electric cooker they would have to do so at their own expense.

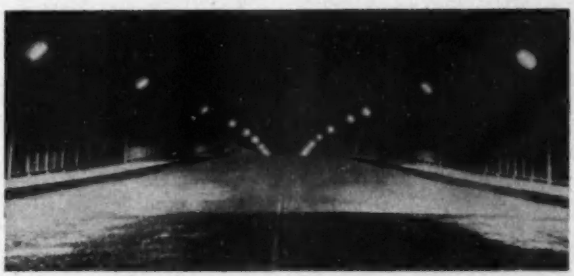
When the Electricity Board learnt of this decision, the commercial staff immediately carried out a weekend canvass of all tenants involved. The result was that 485 affirmed their wish to cook by electricity and only 9 chose gas. To date 446 of those cookers have been installed.

Fluorescent Street Lights in Australia

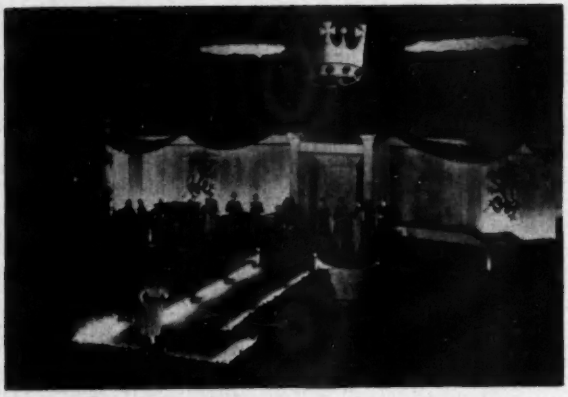
CLAIMED to be the first of its kind in Australia, the British Thomson-Houston Co. Ltd. has just installed fluorescent street lighting on the Fitzroy Bridge, Rockhampton. This township is the centre of an agricultural and mining district in Queensland.

The type of lantern used was the company's SL3500 model, each of which houses two 40 W fluorescent lamps. The lanterns comprise a central backbone carrying two cast aluminium plate ends, control gear and lamps. A "Perspex" cover totally encloses the assembly and light is controlled by an anodised aluminium reflector. The whole has been mounted at an angle of 45° on the standards. There is easy access for lamp replacement and maintenance—being simply a case of unscrewing the end lug and removing the end-cover.

One of the factors to be borne in mind in the locality was the tropical conditions encountered during the year. The equipment installed is entirely satisfactory under these conditions, in fact they had proved themselves in other climes. A notable instance is Singapore, where the same lanterns have been used to good effect, in what is now often referred to as the best-lit city in the East.



Fluorescent street lighting on the recently opened Fitzroy Bridge, at Rockhampton, Queensland



Scene during Berkertex Ltd.'s Edinburgh fashion display

Stage Lighting Enhances Fashion Show

FASHION shows staged by Berkertex Ltd. of New Bond Street, London, are becoming a tradition and increasingly popular. Hand in hand with these displays of fashion is the demonstration of fluorescent stage lighting installed at these functions by Thorn Electrical Industries Ltd. Previously held in Cardiff, Newcastle and Glasgow, the latest show took place in the Usher Hall, Edinburgh.

Our accompanying illustration clearly shows the stage and walk illuminated by three-colour fluorescent lighting reflectors. As models paraded down the walk the colour of the lighting was adjusted to produce the appropriate hue for each garment. These effects were controlled from a small panel on which miniature switches operated motorised dimmers and colour mixing units. The floating crown and clouds above the stage were treated with fluorescent paints activated by ultra-violet tubes.

Technical Reports

THE writing of technical reports is the subject of a new course of six lectures to be given by Mr. G. Parr at the Borough Polytechnic, London. The course will be on Thursday evenings and will begin on January 21. Further details may be found in our classified advertisement columns, page 66. Mr. Parr is technical director of Chapman and Hall Ltd., and hopes to cover the preparation of reports, collection of data, and practical advice on the submission of papers for publication in his six talks.

OFFICIAL PUBLICATIONS

DEVELOPMENT OF INVENTIONS: House of Commons Bill (see page 1159). H.M.S.O. 4d.

E.R.A. REPORT: Z/T93. Self-adjusting Arc and Controlled Arc Welding Processes: Review of Published Information, by W. G. Hull and J. C. Needham, 7s. 6d.

ELECTRICAL ACCIDENTS AND THEIR CAUSES: 1951. H.M.S.O. 3/-.

Hoover Apprentices

APPRENTICE prizegiving for 1952-53 activities has once again taken place at Hoover Ltd's. Perivale factory. Nearly 50 apprentices won awards following another busy year of continued progress. Report on activities and success includes the facts that two apprentices have passed to Universities, and another gained a technical State scholarship, whilst the sport and social side flourishes also. The programme of this important annual function included an exhibition, a talk by athletics coach, Mr. G. H. G. Dyson, and a one-act comedy play "The Anniversary."

GAS TURBINE SET FOR SEWAGE PLANT

THE London County Council is proposing to install three 620 kW gas-turbine generating sets with air blowers, to be driven by methane gas from the sludge digestion plant, as part of its extension programme for the Northern Outfall works. The blowers will have an output of 100,000 cu ft/min, we understand. The Council's Rivers and Drainage Committee has recommended acceptance of the tender of Ruston and Hornsby Ltd. at £635,423 for all the generating plant and ancillary equipment. The Committee reports that, on invitation, three firms submitted prices for all the equipment, but subsequently it was found necessary to revise the specification to increase the air-blowing output and to standardise the type of turbine driving to the blowers and the generators. The two other firms who quoted for the supply of the equipment were Metropolitan-Vickers Electrical Co. Ltd. and Harland & Wolff Ltd.

B.I.C.C. Education Awards

THERE were some 200 awards, nearly 50 more than in 1952, at the annual prizegiving ceremony at Prescot. They were presented by Mr. D. W. Aldridge, director, deputising for Mr. H. J. Stone, director and deputy chief executive. These awards included 30 higher national certificates.

Annual presentations of educational awards at the Leigh and Prescot works of British Insulated Callenders' Cables Ltd. took place a short time ago. Nearly 120 employee-students attended local technical colleges from Leigh and of that number 84 passed, six were engaged on non-examination courses and 25 failed. Twenty-one qualified for awards under the company's Further Education Scheme, of whom four had received higher national certificates and one a B.Sc. Prizes were presented by Mr. F. Waine, director.

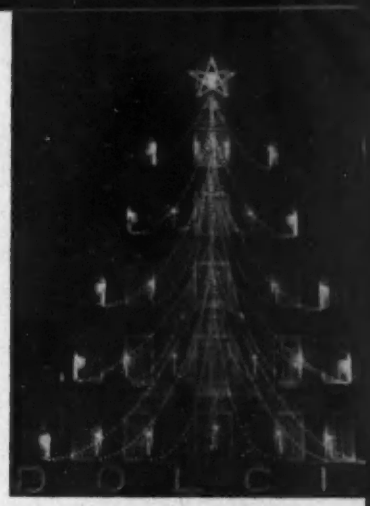
S.E.B. refutes Report of Unfair Demands

ATTENTION was drawn last week by a report in a prominent national daily newspaper to the case of a large building project at Uxbridge (Middlesex) where work had stopped because allegedly the Electricity Board had made impossible demands on the building contractors. In the first place, the report stated, the builder had been asked to provide two substation sites, to lay down a capital contribution of £19,080, to guarantee consumption of electricity valued at £19,040 a year for five years, or failing that to make up the balance. Secondly, a new scheme was proposed whereby the capital contribution was dropped, but the builder was asked to dig trenches and guarantee consumption of £16,067 for each of 5 years. Following that, building was stopped, the report stated.

We contacted the Southern Electricity Board concerning this matter. The Board have stated they know nothing of the first arrangement, nor of any request for a capital contribution. They sought a guaranteed consumption of £1,608 and requested the builders to provide ducts which is the normal arrangement. Neither have the Board heard anything of a stoppage of work, in fact the latest they knew of the scheme was the acceptance of their requests on September 11 last. This building project is understood to involve the erection of 148 houses, and work was begun as long ago as 1946.

Weir Gates now Electrically Operated

THE new electrically operated weir at Caversham has now been completed and is stated by the Thames Conservancy to be operating satisfactorily. It is the first electrical weir to be constructed on the Thames and cost about £26,000. Eight huge gates on the lockside are those worked automatically. Each measures nearly 12 ft by 8 ft and weighs two tons. They open at the press of a button and when reaching their maximum open or closed position—the complete movement takes eight minutes—they stop of their own accord. Each is powered by a separate motor. Should power supplies fail the lock-keeper will have to make 780 turns on a handle to do the same work.



An impressive Christmas tree consisting entirely of lamps, erected on the Oxford St., London, premises of Dolcis Shoe Co. It comprises about 2,000 15W lamps and 150 W lamps for candle frames and the star. Installation was by Courtney Pope (Electrical) Ltd. for Ellis E. Somake, Dolcis' architect

More Help Offered to Inventors

EXTENSION of the period for which the National Research Development Corporation can make grants for the development of promising inventions is the main provision of a Bill which was introduced into the House of Commons last week under the title, Development of Inventions Bill, 1953. The period for which advances may be made is increased from the five years laid down in the 1948 Act to ten years. The period during which interest payments may be waived is similarly extended to ten years. Additional powers proposed in the Bill include giving the Corporation the right to undertake research to satisfy specific practical requirements, or in connection with discoveries likely to have practical importance.

Christmas Displays in London and Birmingham

Just eight days to go to Christmas. Above are suggestions for gifts set against a fairytale background by the G.E.C. in the window of their London offices. On the right is an attractive show on the roof of Bulpitt and Sons, Ltd's premises in Birmingham. Electrical installation was by the firm's electricians using Philips Electrical equipment

Efficiency of Fuel Industries Queried

FORMATION of an investigation committee to effect greater administrative efficiency in the nationalised gas and electricity undertakings was advocated recently by the N.E. Area Council of the National Chamber of Trade. Main cause of grievance appeared to be the money spent by the industries on advertising. They were two monopolies, one member remarked, and the only competition was one against the other. Since both were nationalised he could not see why it was necessary to spend large amounts of money on advertising. By duplicating the advertisements of manufacturers, the undertakings were throwing away their money, he maintained. The manner in which the two industries could continue to demand increased charges without being accountable for their actions, was also deplored.

NEWS IN BRIEF

Annual dinner of the S. Wales Institute of Engineers will be at the Park Hotel, Cardiff, on January 21. Tickets will be 15s. each.

Over 300 guests were present at the 23rd annual ball of the E.I.B.A.'s Northern Counties Area, earlier this month.

Factory Extension

FURTHER large-scale extensions at their Bridgend works are to be carried out by Line Equipment Ltd. This becomes necessary as a result of the very pleasing situation of a continually increasing number of orders. Main extensions are a complete new bay and a new drawing office. During the past three years this company has greatly increased its activities overseas, and a particular feat has been the gaining of a substantial foothold in the dollar market. Recent orders from Canada and the U.S. amount to about $200,000.

Over half of Rhondda's schools have been converted from gas to electric lighting. The remainder will be converted at the rate of about two primary and two secondary a year until all have electricity.

A low-power temporary television transmitting station may be in operation on the Isle of Man by Christmas. A site has been chosen on the outskirts of Douglas and an announcement will be made later as to dates when regular test transmissions and full programme service will start.

The Yorkshire Board is planning to spend £500,000 on rural electrification in the current year, Mr. D. Bellamy, chairman, stated recently at an N.F.U. dinner.

Three U.N. Economic Commission for Europe meetings on electric power opened at Geneva recently. Main work concerns exchange of ideas on rural electrification.

Questions in Parliament . . .

Emissions from Neasden

The question of the emission of smoke, grit, and particles of combustible fuel from Neasden power station was raised by Mr. Viant. He mentioned a petition signed by over 3,000 residents in the area and asked if Mr. Marples had received it. Mr. Viant was told that enquiries were being made into the complaint and that he would receive a letter from the Minister at a later date.

D.S.I.R. Expansion

Further questions were asked last week about the Government's future policy in respect of the Department of Scientific and Industrial Research. It will be recalled that the Financial Secretary to the Treasury stated last month (see our November 19 issue) that a general understanding had been reached providing for gradual expansion over the next five years. Last week Mr. Bevins informed the House that the recent arrangement provides for a 5-year programme on the basis of which the total resources of the Department will cover about 95% of the planned activities mentioned in its 1947-48 Report. Principal provisions comprised an increase of staff of 1,000, bringing the total to 5,100 by 1959; for an increase of about £900,000 (apart from provisions made for services not part of D.S.I.R.'s normal activities); and for a building programme of about £6 million.

Mr. Bevins went on to say it was hoped to make good deficiencies in expenditure in previous years as time went on. He added that Estimates of the Department will be presented to Parliament in the usual way.

Factory Inspectors

Information as to the minimum and maximum age limits for the appointment of Inspectors of Factories was given in a written answer last week. The minimum age was 21 and the normal maximum 30. The latter was sometimes higher for exceptionally well qualified candidates, and for those whose careers were interrupted by National Service.

Purchase Tax Rebates

Mr. R. A. Butler published in *Hansard* last week his reply to the eight manufacturers' associations who submitted suggestions for purchase tax rebates on identifiable goods. In the letter the Chancellor emphasises the fact that publication might have the effect of building up expectation of tax changes, which would have the precise repercussions they were trying to avoid. In his reply to questions in the House, he said the com-

mittee appointed to investigate the difficulties of this problem could find no easy solution, and that he had discovered the same. Mr. Butler went on to say that the proposals submitted were constructive and he was carefully considering them.

Technological Education

The Chancellor of the Exchequer said last week that he would make a further statement as regards the establishment of a college of technology, when all information had been received and examined. Universities and colleges outside London had been invited to submit plans for development, and these had yet to be collated. Replying to another question, he asserted that the Government meant business in the matter and intended to go forward and afford status to institutions endowed. The first one to be mentioned, he said, was London, but Manchester was well in the running for a further place. There was also a certain institution in Scotland envisaged.

Electricity and Gas Research

Sir W. Wakefield asked what steps were being taken to increase co-operation between the electricity and gas industries on mutual problems of research. He was informed that the Scientific Advisory Council periodically reviewed research programmes in the whole field of fuel and power, and both industries were represented on the Council. The procedure appeared to give entirely adequate opportunity for the discussion of such problems.

It was also stated that as regards exploration for natural gas, surveys were under way in Yorkshire and Lincolnshire, and drilling was expected to begin soon in Scotland and Sussex.

Price of Iron and Steel Goods

Mr. Duncan Sandys announced last week that full responsibility for the supervision of prices of iron and steel will be taken over by the Iron and Steel Board. The Board is empowered under the 1953 Act to fix the maximum prices charged in this country by iron and steel producers, if these prices are not already controlled by the Government. As a result of the Minister's decision all existing Iron and Steel Prices Orders have been revoked, and the Board intends to fix maximum prices covering approximately the same range of goods. Except in a few minor instances, existing price schedules will remain unaltered for the time being. The Board's powers do not extend to the control of scrap prices and consequently relevant orders covering scrap remain in force.

Frequency Changes

The Assistant Postmaster-General said he appreciated that frequency changes were inconvenient to operators of mobile radios but could see no way of improving the situation except by giving the maximum notice possible.

Pedestrian Crossings

In a written answer on Wednesday, Mr. Lennox-Boyd said he had received few complaints from the public about flashing beacons and none from any organisation representing road users. As regards alternatives, he said floodlighting had been considered but was rejected as ineffective in wet weather.

T.V. in Carlisle and Wales

The House was told last week that no decision could be made yet on B.B.C. plans to provide television coverage in the Carlisle area. Similarly, Mr. Gammans said, it was too early to make a statement about additional television stations in Wales.

O.H. Line Interference with T.V.

It has been alleged that television interference in the Sutton-on-Trent district was caused by high tension transmission lines. In a written answer last week, Mr. D. Gammans confirmed that it was now known the trouble lay in a 300 yd stretch of h.t. line, but the exact location of the cause of interference had not been found. Certain pieces of equipment had been renewed, but so far had not solved the difficulty. A further test was to be carried out this week, he added. The difficulty was that for a detailed examination, supplies of electricity to a number of voltages would have to be cut off.

Rights of Entry

Miss I. Ward's private Bill, the Rights of Entry (Gas and Electricity Boards) Bill was given an unopposed second reading in the House on Friday. It was committed to a Committee of the whole House and is due to be considered in that stage of procedure on January 29.

Atomic Energy

On Thursday last a motion for an address to annul the Statutory Instrument transferring responsibility for atomic energy development from the Minister of Supply to the Lord President of the Council was defeated. In the course of the debate on the motion, Sir David Eccles, the Minister of Works, said that the most compelling reason for the transfer was the competition between bombs and electric power stations for the same fissile materials. The Ministry of Works, he said, had 950 professional staff engaged on nothing but drawings and designs for atomic energy plants.

Notification of Vacancies

In a written reply given on Thursday last, the Minister of Labour said that he was satisfied that the Notification of Vacancies order could not be dispensed with at the moment.

P.T. and Receivers

In a written question on Thursday last, Mr. Hector Hughs asked the Chancellor of the Exchequer if he would remit or remove purchase tax on radio and television sets purchased by or for old age pensioners and their associations and community centres. Mr. Boyd-Carpenter, in his reply, regretted that this was not possible.

Electric Supply News . . .

Belfast

At a special meeting this week, the Corporation is being recommended by the Electricity Committee to approve the re-advertising for tenders for boilers for the extension of the West municipal power station. Tenders already received will not be re-opened until the others are received in reply to the new advertisement, which, the committee state, will allow for a specification that will permit tenderers to submit prices for alternative equipment. By this means, some members of the committee hope that a saving in the region of £250,000 may be made. On seeking legal opinion, the committee were advised that the Corporation must re-advertise on a changed specification in order to allow tenderers to quote for alternative equipment. Certain firms could not quote for proprietary equipment, but were able to supply alternative plant, apparently.

Cheltenham

January 27 has now been fixed as the date for the opening of the public enquiry on the B.E.A.'s proposal to erect 275 kV grid line over the Cotswolds from Melksham to Birmingham. The Ministry of Fuel and Power has nominated Mr. H. W. Grimmitt, its chief engineering inspector, and Mr. H. R. Wardill, a senior planning inspector, Ministry of Housing and Local Government, to hold the inquiry, which is to take place at Cheltenham Town Hall.

East Midlands

By the end of the next five-year period the East Midlands Electricity Board hoped to have 90% of the farms in its area connected for electricity, Mr. C. R. King, chairman of the Board, told farmers' representatives from Leicestershire, Derbyshire, Notts, Lincs, and Northamptonshire recently. But if farms were to be connected at the rate planned increased revenue would have to be received from farmers and he preferred that this should come in the form of increased consumption rather than an increase in the farms tariff. Since the Board took over in 1948 the number of farms taking a supply of electricity had increased by over 5,200 to a total of 16,666—the largest increase shown by any Electricity Board in the country, he said. The amount that the Board would spend on rural development for the year ending March 31, 1954, would be over £800,000 and the figure would rise to about £1,000,000 in each of the years 1955 and 1956. He anticipated that the number of connections of farms would reach 1,400 a year.

Isle of Man

A two-man commission has now been appointed by His Excellency the Lieutenant-Governor to inquire into the Isle of Man's electricity supply position, following the debate in Tynwald which we reported on November 26. The two members are Sir William Robinson, KT., D.L., J.P., who will be chairman, and Mr. W. J. McC. Girvan, O.B.E., A.M.I.E.E., with Mr. R. E. Kaye acting as secretary. Sir William Robinson was a member of the Electricity Board for Northern Ireland for ten years, including eight years as chairman, and Mr. Girvan retired in September 1952 from the position of city electrical engineer and general manager at Belfast, which he had held since 1942. This new commission is authorised "to take evidence to investigate the generation, transmission and distribution of electricity in the Island, and to make recommendations with a view to ensuring that the general public receive an adequate supply at the cheapest possible price."

N. Ireland

When the inquiry into the proposed Bann hydro-electric scheme was re-opened last week, Mr. B. D. Richards, of Sir William Halcrow and Partners, stated that a similar scheme at the Mourne River would be about 50% larger than the Bann project. The two schemes would provide 15 to 20% of the N. Ireland Board's power requirements. It was now estimated that the Bann scheme would cost £2,195,000—21·7% higher than the original estimate, but the cost of thermal power had increased correspondingly, he added. Outlining the case for the Ministry of Commerce, Mr. C. A. Moody stressed that a commonsense justification of the scheme was that Northern Ireland was almost entirely dependent upon thermal power from stations which were supplied by imported coal. The need to develop an alternative source of power was governed by the vulnerability of the country in the event of war and the fact that, in using coal, they were using a wasting asset from the valuable assets of the U.K. Mr. G. Kennedy, consulting engineer, stated that the scheme would provide 46 million units per annum, at a price which compared favourably with the cost of producing the same quantity from a steam power station.

LIGHTING SCHEMES

Cleethorpes.—The Lighting Committee has recommended an illumination scheme for the whole length of the promenade, with numerous working set pieces, for the next season.

Fareham.—The Council is seeking consent to borrow £3,719 to improve street lighting on the main road between the Gosport boundary and Fareham viaduct.

Guildford.—T.C. is recommended to approve a scheme for installing 112 street lamps on various roads, at a cost of £4,312.

Lancaster.—Street lighting is to be converted from gas to electricity. Allocation of £5,000 is to be made in next year's estimates covering a portion of the work.

Company Activities . . .

Contactor Switchgear Ltd.

Dealings are expected to start in London and Birmingham on Monday next, December 21, in the 5s. Ordinary shares of this company, the marketing of which has been arranged by Minster Trust.

Dictograph Telephones Ltd.

This company has invested more money in rental installations during the year ended August 31 last than in any previous year in its history, Mr. P. V. Summer, the chairman, states. The benefit of the increased yearly rental income will be felt by the shareholders in subsequent years. In view of this, the directors are not greatly concerned over the reduction in cash sales.

Electrical Apparatus Co. Ltd.

The dividend is to be 20% for the year ended July 31 last, and this on capital which was increased by the 20% scrip issue. For the previous year the dividend was 15% on the smaller capital. The group trading profit for the year to July 31 last is £193,355, which is over £80,000 higher than that of the previous year. We noted on December 3 that arrangements are being made to have the Ordinary shares quoted on the London market.

General Cable Manufacturing Co. Ltd.

The reduction both in the trading and net profit of this concern for the year ended September 30 last, would seem to be due to the general halt in orders which affected many of the cable manufacturers earlier this year when copper was being returned to the free market. The full accounts show that at September 30 last, stock in trade

Year to Sept. 30	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	120,473	46,715	67	30	18/9	16/6
1952	146,077	47,766	70	30*	16/10	11/10
1953	119,288	45,078	53	30	17/-	14/9

* On increased capital.

and sundry stocks were valued at £188,545, a reduction of about £30,000 from a year previously. In all, current assets amount to £473,128, while liabilities and provisions total £86,583. The directors have provided for a Coronation bonus of £500 to the staff.

Longmore Brothers Ltd.

During the greater part of the trading year ended August 4 last, output was very much increased, the value of the turnover also being higher than that of the previous year, Mr. C. Longmore, chairman and managing director, has stated. But with lower profit margins the trading profit was slightly reduced, as we noted on November 5. With regard to future prospects, no effort is being spared to maintain and increase both the home and export trade.

Peto Scott Electrical Instruments Ltd.

It is stated that the accounts for the year ended June 30 last are delayed owing to the fact that the insurance claim for loss of profits due to fire damage suffered a year ago has not yet been agreed. According to the company, this claim may be in the neighbourhood of £40,000, which figure is in excess of profits of the preceding year. The claim for damage to assets has been agreed.

Plessey Co. Ltd.

With the exception of the domestic radio side, the concern is, in general, busy, Mr. A. G. Clark, the chairman and managing director, reports. There are indications of slightly better business so far as concerns domestic radio, but the improvement has not been as great as had been hoped, he adds. There is a satisfactory volume

Year to June30	£ Trading Profit	£ Net Profit*	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	297,235	84,647	43	20	18/7	13/-
1950	284,112	70,058	33	20	19/-	14/3
1951	812,463	214,146	144	22½	22/3	17/-
1952	979,919	232,575	158	25	21/-	16/3
1953	1,025,718	326,856	202	30	32/3	20/1

* Available for the parent company.

of orders and the forward load is about the same as at this time last year. During the course of the current financial year it is proposed to submit suggestions with a view to bringing the capital into closer relation with the assets and earning power, and to provide the company with adequate funds to take care of the further expansion which is envisaged over the years immediately ahead.

Yarrow and Co. Ltd.

This concern has had another busy year. Apart from its marine business, contracts are in hand for boilers for the B.E.A., and the African sub-

Year to June30	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	236,164	83,242	55	15	5	80/-
1951	377,279	138,274	88	15*	67/6	48/9
1952	615,093	208,818	133	20	59/-	51/3
1953	613,142	190,544	115	20	66/-	56/6

*Plus 100% capital bonus.

sidiary is very active also. Sir Harold Yarrow states that a further £60,000 has been allocated for improvements.

Dividends Declared

British Insulated Callender's Cables Ltd.—Interim of 2½% *(2%)*, but the directors add that this increase does not imply a higher total distribution for the current year.

Thomas De La Rue and Co.—There is again to be no Ordinary interim dividend, although the directors state that it appears probable that the results for the current year will show a satisfactory improvement.

Commercial Information

CONTRACTS OPEN

HOME

Dates given are the final for receipt of tenders, unless otherwise stated

18 Dec.—Belfast T.C. Turbo-alternators, feed heating and condensing plant sets, generator transformers, and circulating water pumps for Power Station West.—Advertised in Oct. 15 issue.

18 Dec.—Belfast T.C. 110 kV oil pressure or gas type, and 33 kV main cables, auxiliary cables and accessories.—Advertised in Nov. 5 issue.

18 Dec.—Durham. Installation in Billingham North and Windleston Hall schools.—See Dec. 10 issue.

18 Dec.—Londonderry. Installation in Tobermore school.—See Dec. 10 issue.

18 Dec.—Windsor T.C. Installation in 36 flats in Dedworth Rd.—See Nov. 12 issue.

18 Dec.—Windsor T.C. Installation in 144 houses in Vale Rd., East and West Crescents.—See Dec. 3 issue.

19 Dec.—Denbighshire. Installations in schools at Abergele and Cefn Mawr.—See Dec. 10 issue.

19 Dec.—Ely U.D.C. Wiring 20 bungalows in Archery Cres.—See Dec. 3 issue.

19 Dec.—Lancashire. Supply only of 144 batten instant-start twin 5 ft fluorescent fittings with reeded glass sides to Ashton-under-Lyne College of Further Education. Applications by above date to County Architect, County Hall, Preston.

19 Dec.—Sleaford U.D.C. Street lighting.—See Dec. 3 issue.

21 Dec.—Bradford T.C. Electrical installation in Buttershaw primary school. City Architects Office, Town Hall.

21 Dec.—Lancashire. Electrical installation in Rivington and Blackrod grammar school. Applications by above date to County Architect, County Hall, Preston.

21 Dec.—Walsall T.C. Substation equipment.—See Dec. 10 issue.

23 Dec.—Castle Ward (Northumb.) R.D.C. Installation in 146 houses at Brunswick Village.—See Dec. 3 issue.

23 Dec.—Chester T.C. Design and installation of electrical equipment at Highfield junior school, Blacon. City Engineer, Municipal Offices.

23 Dec.—Manchester T.C. Installation in dwellings in Tetbury, Longlevens and Flaxcroft Rds.—Advertised in Dec. 10 issue.

23 Dec.—N. Ireland. Electrical improvements at Daisy Hill Hospital, Newry.—See Dec. 10 issue.

23 Dec.—Penybont (Glam.) R.D.C. Rewiring and lighting and heating points at Council Offices.—See Dec. 10 issue.

24 Dec.—Londonderry. E.H.T. ironclad switchboards. — See Dec. 10 issue.

26 Dec.—N. Ireland. Installation in Ralvo Presbyterian church, Larne.—See Dec. 3 issue.

28 Dec.—Fifeshire. Electrical work at Auchterderran South school.—See Nov. 26 issue.

29 Dec.—Newbiggin U.D.C. Installation in 20 houses in Welfare Cres.—See Dec. 10 issue.

30 Dec.—Morecambe and Heysham T.C. Installation in 51 houses.—See Dec. 10 issue.

31 Dec.—Dublin. Installation at Mount Sackville Convent school.—See Dec. 10 issue.

31 Dec.—Burnley T.C. Electrical installation in Heasandford secondary modern school. Applications by above date to Architects, Kitson, Parish, Ledgard and Pyman, Lloyds Bank Chambers, Vicar Lane, Leeds.

31 Dec.—Croydon T.C. Supply of flashing beacon equipment for pedestrian crossings. Borough Engineer, Town Hall.—Advertised in this issue.

31 Dec.—Wembley T.C. Supply of lamps required during year beginning April 1, 1954. Maintenance and Transport Engineer, Town Hall.

1 Jan.—Belfast T.C. Equipment required for year ending March 31, 1955.—Advertised in Dec. 3 issue.

1 Jan.—Belfast T.C. (a) Telegraphs and operational telephones, and (b) lighting and heating installation in switchhouse.—Advertised in Dec. 3 issue.

1 Jan.—Wandsworth B.C. Lamps during year from April 1 next.—See Dec. 3 issue.

2 Jan.—Hendon T.C. Supply and erection of lanterns for 140 W. sodium lamps with transformers, condensers, wiring, etc., and also supply of concrete standards, for street lighting. Applications by Dec. 22 to Engineer and Surveyor, Town Hall, N.W. Deposit £2 2s.—Advertised in this issue

2 Jan.—Swansea T.C. Equipment for Technical College.—Advertised in Dec. 10 issue.

4 Jan.—Lancaster T.C. Plants for pumping stations.—See Nov. 4 issue.

4 Jan.—Leyton T.C. Street lighting.—Advertised in Dec. 10 issue.

5 Jan.—Beverley (Yorks) R.D.C. Installation of electricity in 10 houses at Beswick. G. Palfreyman, Engineer, Surveyor and Architect, 22 Lairgate. Dep. £1.

5 Jan.—Epping U.D.C. Supply and erection of 17 Class B concrete street lighting columns on Beaconfield estate. Council's Surveyor, 91 High St.

6 Jan.—Rowley Regis T.C. Street lighting on Tividale Hall estate.—See Dec. 10 issue.

6 Jan.—Skelton and Brotton U.D.C. Wiring and installation of fittings in 16 houses in Brotton estate. Engineer and Surveyor, Council Offices, Skelton-in-Cleveland. — Advertised in this issue.

7 Jan.—Bridgwater (Som.) T.C. Supply and installation of two 35 b.h.p. electrically operated motors, switchgear, etc., at Ashford waterworks. Borough Engineer, Town Hall. Deposit £1 1s.

7 Jan.—Carlow (Eire) Installation at Carlow Mental Hospital.—See Dec. 10 issue.

9 Jan.—Bootle T.C. Lamps, cables and other electrical goods included in supplies required during year beginning April 1 next. Borough Surveyor, Town Hall.

9 Jan.—Dagenham T.C. Lamps, cables, conduit and accessories for year beginning April 1 next.—See Dec. 3 issue.

9 Jan.—Finsbury B.C. Lamps wanted during year ending Mar. 31, 1955.—See Dec. 10 issue.

9 Jan.—Romford T.C. Lamps included in list of annual supplies.—See Dec. 3 issue.

11 Jan.—Aberdare U.D.C. Supply and erection of public lighting equipment at Hirwaun Rd., and Victoria Sq. Engineer and Surveyor, Vestry Hall.—Advertised in this issue.

15 Jan.—Lerwick (Scotland). Installation in school at Bell's brae.—See Dec. 10 issue.

18 Jan.—Market Harborough U.D.C. Overhead lines and underground cable in waterworks extension.—Advertised in Dec. 10 issue.

22 Jan.—Edinburgh T.C. Electrical installation in 32 houses, and five shops at Canongate. City Architect, City Chambers.

25 Jan.—St. Neots U.D.C. Three sets of electrically driven vertical unchokeable sewage pumps and ancillary equipment. John Taylor and Sons, Artillery House, Artillery Row, Victoria St., Westminster. Deposit £5.

27 Jan.—Stamford (Lincs.) T.C. Street lighting.—See Dec. 10 issue.

No date stated—Midlothian. Electrical work in primary school at Pinkie, Musselburgh. County Architect, 32 Palmerston Place, Edinburgh.

No date stated—St. Andrews (Fife) T.C. Electrical installation in 58 houses at Auld Barn Park. Apply to J. C. Cunningham, architect, 10 Alexandra Place.

No date stated—N. of Scotland H.E. Board. Supply of 132 kV switchgear and ancillary equipment for Shin substation. Kennedy and Donkin, 12 Caxton St., London S.W.1. Deposit £2 2s.—Advertised in this issue.

OVERSEAS

Details of items marked • may be obtained on application to the Board of Trade, Lacon House, Theobalds Road, W.C.1, quoting reference.

7 Jan.—South Africa. Supply of 48 150 MVA 6·6 kV vertical draw-out switchboard cubicles without current transformers; and 12 class D 15 VR 6·6 kV current transformers of ratio 15/5 for 250 MVA circuit-breakers. Contract 160. Tenders invited by Stores and Buying Branch, City Treasurer's Dept., Johannesburg. B.o.T (Ref.: ESB 11224/53)•.

26 Jan.—Egypt. Supply and erection of transmission lines feeding Qaha factory and switching and transformer stations nearby. Documents from Chief Inspecting Engineer, Egyptian Govt., 41 Tothill st., London S.W.1. Deposit £E3.

27 Jan.—New Zealand. Tenders invited (P. and T. 150/6579) for 2,100 3-4 ft fluorescent tube starters. Director General, Stores Div., G.P.O., Wellington. B.o.T. (Ref.: ESB 10940/53)•.

28 Jan.—India. Supply of 110 h.t., and 48 l.t. circuit-breakers for Bombay Electric Supply and Transport Undertaking, Electric House. Tender No. E.S. 111/53. B.o.T. (Ref.: ESB 10681/53).•

5 Feb.—India. Supply and erection of 200-ton electric cantilever crane at King George's Dock, Calcutta. Details from Chief Engineer, T. M. Malkain, Commissions for Port of Calcutta. Deposit Rs. 20.

12 Feb.—Australia. Supply of 3000 3 x 10-40 amperes (long range) 3 x 240 V 3-phase, 4-wire, a.c. kW/hr meters for Brisbane City Council. Tender No. E.29/53. Town Clerk, City Hall. B.o.T. (Ref.: ESB 10175/53).•

18 Feb.—Portuguese E. Africa. Supply and installation of materials for electric power distribution network. Municipal Council, Lourenco Marques. B.o.T. (Ref. ESB 11576/53).•

CONTRACTS PLACED

Ashington (Northumb.) U.D.C. Electrical installation in 64 houses in Darnley Rd., J. A. Oliver.

Bradford T.C. Renewal of electrical installation in Rawson Place Market, Norris Jowett, Ltd., £1,129.

Glasgow T.C. Supply of 100,000 yd. aerial cable, L.P.S. Electrical Co., Ltd., £2,585.

Houghton-le-Spring U.D.C. Electrical installation in 132 houses, B. L. Oliver, £3,658.

Ramsgate T.C. Conversion of street lighting from gas to electricity, S.E. Electricity Board, £3,187.

Hull T.C. Electrical installation in 223 dwellings on Longhill estate, and at Longhill primary school, Booker and Tarran.

Smethwick T.C. Electrical installation in George Betts junior school, Midland Electricity Board, £1,357. Also supply and erection of concrete columns and lanterns along 16 roads, General Electric Co., Ltd., £13,703, and connecting same to supply, Midlands Electricity Board, £5,817.

Stafford T.C. Installation of street lighting along Lammascote Rd., Riverway, and Newport Rd., General Electric Co., Ltd., £2,891.

Your Queries — Answered

"Merrifire" irons, makers of? W.P.—Homefyre Ltd., 66 Brewery Rd., London N.7. (25146)

"Maymore" soldering irons, makers of? E.B.—These were taken over, in 1935, by W. T. French and Son, Ltd., Browning St., Ladywood, Birmingham 16. (25163)

"Clarbat" infra red emitters, makers of? N.S.—Clarbat Ltd., 302/304 Barrington Rd., S.W.9. (25182)

"Timlec" clocks, repairers of? M.B.—Comer Electrical Repair Service, 23 Bridge St., Taunton, Somerset. (25199)

"Lane" tape recorder, suppliers of? S.B.—Verdik Sales Ltd., 17 Shaftesbury Ave., London, W.1. (25207)

"Handy-vac" vacuum cleaners, repairers of? G.S.—Hotpoint Electrical Appliance Co., Ltd., Crown House, Aldwych, W.C.2. (25227)

"Minifon" recorders, address for? N.A.—Minifon (Gt. Britain) Ltd., 45 Curzon St., W.1. (25245)

"B & Y" toasters—suppliers of? T.E.—Beanwy Electric Ltd., Rushley Lane, Tyseley, Birmingham. (25274)

The above are selected from questions we have answered this week. If you have a query, send it to us.

ANSWER WANTED

"Reynolds" irons—makers of? T.B. (25290)

Stourbridge T.C. Supply and erection of 87 Class B street lighting columns and lanterns on Pedmore Fields estate, Midlands Electricity Board, £1,450.

Stockton-on-Tees T.C. Electrical work at Roseworth junior school, H. G. Sproates, £1,652.

Stretford T.C. Supply of 60 street lighting columns, Metropolitan-Vickers Electrical Co., Ltd., £1,642.

Tynemouth T.C. Electrical installation in 142 houses on Chirton Grange South estate, Hartley Electro-Motives, Ltd., £3,453.

Wanstead and Woodford (Essex) T.C. Second stage of group B lighting scheme, Harland and Wolff, Ltd., £3,754.

Woolwich B.C. Electrical installation in 128 flats on Bostall estate, London Electricity Board £5,445.

Worcester T.C. Installation of 120 lamps on Dines Green estate, Midlands Electricity Board, £2,382.

Worcestershire. Renewal of wiring at county buildings, Midlands Electricity Board, £1,744.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Central Refrigeration Ltd. At meeting on Nov. 24 resolution for voluntary winding-up passed, and at subsequent meeting of creditors Mr. H. W. Pitt, C.A., Salisbury Sq. Hse., Salisbury Sq., E.C.4, was appointed liquidator.

Supreme Refrigeration Co., Ltd. Meetings of members and creditors will be held at offices of Harry L. Price and Co., 47 Mosley St., Manchester, on Jan. 29, at 3 p.m. and 3.15 p.m. respectively.

BANKRUPTCY ACTS

Release of Trustee

Chelmsford. Bertie A. Murton, electrician, trading at 54 The Green, Writtle. Trustee was W. J. Wallis Hill, Official Receiver, 58-61 York Terrace, Regents Park, N.W.1.

Intended Dividends

St. Albans. Allan J. Coles, electrical engineer and contractor, trading at 2a Pinner Rd., Harrow. Last day for receiving proofs, Dec. 22. Trustee is W. J. Wallis Hill, Official Receiver, 58-61 York Terrace, Regents Park, N.W.1.

PRICE OF CABLE METALS AND OTHER MATERIALS
(Official prices on Monday, Dec. 14)

	£ per ton	Weekly change
COPPER, standard class A (settlement)	228½	−6
,, (3 months)	218½	−6½
LEAD, refined pig, min. 99·97% purity (cash)	90	−1
,, (3 months)	88½	−¾
TIN, refined, min. 99·75% purity (settlement)	640	−30
,, (3 months)	620	−27½
ALUMINIUM, ingots 99-99·5%	150 0 0	—
ZINC, virgin, min. 98% purity (cash)	74	—
,, (3 months)	73¾	−¾
RUBBER No. 1, RSS. spot (per lb.)	17½d.	−⅛
,, c.i.f. basis, ports. Feb. (per lb.)	17½d.	−⅛
ARMOURING:		
Galv. Steel Wire (0·104 in.)	51 10 0	—
Mild Steel Tape (0·014 in.)	40 0 0	—

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Chill Chaser. 722,502. Class 9. Elements for steam irons. Remploy, Ltd., 25-28 Buckingham Gate, S.W.1.

Colovox. 722,621. Class 9. Electric and electronic apparatus, etc. Dictating Machine Co., 32 Victoria St., S.W.1.

Dragon. 714,425. Class 9. Radio apparatus. Rees Mace Marine, Ltd., 11 Hinde St., W.1.

Evorist. 722,796. Class 9. Wiring systems, etc. Enfield Equipment Co., Ltd., 133 Moorgate, E.C.2.

Exide Double-Life. 722,313. Class 9. Accumulators. Chloride Electrical Storage Co., Ltd., Exide Works, Clifton Junction, near Manchester.

Microvox. 721,818. Class 9. Electronic sound recording and reproducing apparatus, etc.

Mycalon. 722,063. Class 17. Moulded insulating materials. Mycalex Co., Ltd., Ashcroft Rd., Cirencester, Gloucestershire.

Permanoid. 722,410. Class 9. Insulated wires. Associated Technical Manufacturers, Ltd., Vincent Works, New Islington, Manchester 4.

Quad. B719,299. Class 9. Sound amplifiers. Acoustical Mfg. Co., Ltd., St. Peter's Rd., Huntingdon.

Regustat. 722,813. Class 9. Thermostatically operated switches. Arcolectric (Switches), Ltd., Central Avenue, West Molesey, Surrey.

Silver-Swan in design B721,497. Class 11. Electric lamps. Edison Swan Electric Co., Ltd., 155 Charing Cross Rd., W.C.2.

Taskmaster. 722,436. Class 11. Lighting installations, etc. Benjamin Electric Ltd., Brantwood Rd., N.17.

Tempatrimmer. 722,839. Class 9. Trimmer condensers. Oxley Developments Co., Ltd., White Hart Yard, Market Place, Ulveston, North Lancs.

Thorn. B692,441. Class 9. Irons, etc. Thorn Electrical Industries, Ltd., 105/109 Judd St., W.C.1.

Twintel. 720,347. Class 9. Junction boxes. Sterling Cable Co., Ltd. Sterling Works, Aldermaston, Berks.

Vulcathene. 722,679. Class 9. Wires and cables. Wm. Geipel, Ltd., Vulcan Works, 156/170 Bermondsey St., S.E.1.

TRADE NOTES

New Branch. Smart and Brown (Engineers), Ltd., have this week opened a new branch at 120 Victoria St., Bristol 1.

U.K. Subsidiary. The Leeds and Northrup Co. of Philadelphia, U.S.A., have formed a new subsidiary in the U.K. to manufacture certain types of industrial and scientific measuring and recording equipment. It is a joint venture with the Integra Co., which was itself formed by Leeds and Northrup to manufacture, assemble and sell some of its products in England. The new company, called Integra-Leeds and Northrup, has taken over from its two parent concerns the rights to make and sell their products in this country.

Change of Name. The name of Gillott Electro Steam Cookers, Ltd., has been changed to Gillott Electro Appliances, Ltd.

BUSINESS PROSPECTS

HOME

Beeston and Stapleford (Notts) U.D.C. Allocation of 300 houses has been received for 1954.

Birkenhead T.C. Approval given to erection of 325 houses on Overchurch estate.

Border (Cumb.) R.D.C. Construction of 71 houses at Madam Banks, Dalston. Housing Architect, 5 Victoria Place, Carlisle.

Bournemouth. Planning permission sought by Hamworthy Engineering Co. Ltd., for erection of factory, offices, etc., in Wallisdown Rd.

Brighton. Leytonstone Jig and Tool Co. Ltd., are to extend premises at cost of about £50,000. Plans by Nightingale and Ambrose, 27 John Adam St., W.C.2.

Bristol T.C. Expenditure of £119,000 anticipated during 1954 for next two stages of construction of Council House at College Green. Electrical work will probably account for about £10,000 of that sum.

Burnham-on-Sea (Som.) T.C. Revised layout approved for 120 houses.

Cardiff T.C. Construction of primary junior and infants' school at Llanrumney. R. L. Brewis, 11 Cathedral Rd.

Chatham. It is proposed to build £10,480 clinic on Wayfield estate.

Chatham T.C. Plans in hand for erection of over 1,000 houses on Lords Wood estate. It is proposed to build 40 bungalows on Weeds Wood estate early in New Year.

Chelmsford. Work to start soon on four-bay factory proposed by British Vitamin Products Ltd. on Widford site. First stage to cost about £90,000. T.C. has scheme in hand for erection of six shops and six dwellings on Westlands estate.

Coulsdon and Purley U.D.C. Scheme approved for erection of about 300 houses in Old Lodge Lane, Purley.

Crombie (Fife). All trades for erection of 50 houses. Scottish Special Housing Assoc., 15-21 Palmeston Place, Edinburgh.

Darlington T.C. Forty houses to be erected at Branksome and 28 at Firth Moor. Borough Architect, Central Buildings.

Dollar (Clackmannan) T.C. Thirty houses to be built at Craiginnan Park.

Dorchester T.C. Erection of 40 houses on Poundbury estate. Architect, L. Magnus Austin, Bowling Alley Walk.

Durham. Div. Coal Board is planning erection of medical treatment centres at further nine collieries. Board's Architects at Ashfield Tower, Kenton Rd., Gosforth.

Eastbourne. Hotchkiss (Eastbourne) Ltd. planning to build factory and a 2-storey office block on Brampton Rd. trading estate.

Esher (Surrey) U.D.C. Proposal to instal light and power points in 50 houses has been approved in principle. Cost estimated at £1,360.

Eston (Yorks.). Licences have been issued to Dorman Long and Co., Ltd., Middlesbrough, for alteration to Cleveland works costing £37,460. Also, U.D.C. to build 40 houses on Lowfield estate and 16 on Redcar Rd. East estate.

Folkestone T.C. Plans to be prepared for development of several small sites by erection of about 107 dwellings.

Gillingham (Kent) T.C. Erection of 124 dwellings on Twydall/Beeches estate. Borough Engineer's Dept., Municipal Bldgs. (Work to start about Feb.)

Glasgow. Plans for new factory at Possilpark for L. K. MacKenzie and Partners, Ltd., have been approved.

Great Yarmouth T.C. Erection of 62 flats and maisonettes in Middlegate St. scheme. Borough Engineers' Architect's Office, 8a Queen St.

Hartlepool T.C. Erection of three blocks of 3-storey flats in Coverdale St. area. Borough Engineer, Borough Buildings, Middlegate.

Keighley T.C. During 1954 it is expected that 170 houses will be built on Braithwaite estate. Four houses to be built also at Haworth.

Luton. South Beds. Sheet Metal Co., Ltd., to build new factory in Union St.; and Three Star (Luton), Ltd., planning to extend their premises in Waller Ave.

Manchester T.C. Construction of 269 houses on Langley estate, Middleton. Director of Housing, Town Hall.

Mansfield T.C. Layout plan approved for 155 dwellings near Beck Crescent.

Newcastle-on-Tyne T.C. It is proposed to build home for old people at Kenton Hall, costing about £33,680. Plans prepared for £92,000 Kenton primary school. Quantity surveyors for proposed Fawdon primary school are Curley and Edwards, Eldon Square.

North Kesteven (Lincs) R.D.C. Construction of 30 dwellings on Potterhanworth estate. Council's Surveyor, J. Chadwick, 31 Clasketgate, Lincoln.

Northampton T.C. Approval given to erection of 10-storey block flats with smaller blocks of flats, houses and bungalows off Castle Street.

Northumberland. Permission sought to proceed with £9,000 scheme for child welfare clinic at Red Row, Broomhill.

Northumberland. New contractor to be selected to complete electrical installation at Longbenton (No. 3) county primary school.

North Riding. Erection of junior school at Thornaby. F. Barraclough, County Hall, Northallerton. Work expected to start next summer on £43,000 scheme for new police headquarters at Whitby.

Nottingham T.C. has received allocation of 1,100 houses for 1954.

Pewsey (Wilts.) R.D.C. Twenty-two houses to be built at Collingbourne Ducts, 18 at Ludgershall and 10 at Birbage.

Plymouth. Dent, Allcroft and Co., Ltd., are to build new factory in district. Work expected to begin early in New Year.

Poplar B.C. Rider, Hunt and Partners, Bridge Hse., Queen Victoria St., E.C.4, will probably be quantity surveyors for erection of 54 flats in St. John's Parish area.

Ryde (I.O.W.) T.C. Approval sought for erection of 40 houses in Mayfield Road.

Stockton-on-Tees T.C. Outline plans approved for first stage of scheme for new bus station.

Stourport U.D.C. Preliminary plans approved for construction of 300 houses on Walshes Farm estate.

Strood (Kent) R.D.C. 144 houses to be built on London Rd. site, Higham.

Sunderland T.C. Four- or five-

storey flats being considered for Adelaide Place—making provision for about 300 families.

Wandsworth B.C. Revised scheme in hand for erection of 51 flats, 48 houses and 10 old persons' dwellings as first phase of West Hill site.

OVERSEAS

Costa Rica. F. Neville Clarke of Calle 19, 781 San Jose, is interested in representing, on commission basis, U.K. manufacturers of petrol generating motors of between 300 and 1,000 W capacity.

West Indies. Mutual Brokers Ltd., of 64 Laws St., Kingston, propose to expand to cater for sugar estates and agriculture. They wish to represent U.K. makers of (among other items) engine driven generating and pumping sets, alternators, d.c. generators, motors, and lamps.

MEETINGS TO NOTE

THURSDAY, DEC. 17

INSTN. OF MECH. ENGINEERS.—Discussion on "Rapid Shutting-down of Large Generating Plant Under Fault Conditions." Storey's Gate, S.W.1, 6.45 p.m.

I.E.E. (Southern).—Annual dinner and dance at Polygon Hotel, Southampton, 7 p.m.

I.E.E. (Irish).—"Servo Systems." L. B. D'Alton. Trinity College, Dublin, 6 p.m.

TV SOCIETY. — "Information Theory and TV." Dr. E. C. Cherry. Imperial College, 7 p.m.

INST. OF FUEL (Midland).—Discussion on "Points System for Coal Evaluation." Imperial Hotel, Birmingham, 6 p.m.

INST. OF FUEL (Scottish).—Discussion on "Training in Fuel Technology." Principal H. B. Nisbet, C. W. Marshall and W. G. Marksell. British Hotel, Edinburgh, 7 p.m.

A.S.E.E. (Luton).—Film Show at Co-op. Cocoa Works, Dallow Rd., 8 p.m.

FRIDAY, DEC. 18

I.E.E. (N. Staffs).—"Co-ordination of Insulation of High-voltage Electrical Installations." J. S. Cliff. Technical College, Stafford, 7 p.m.

INSTN. OF MECH. ENGINEERS.—"New British Standard System of Limits and Fits." H. G. Conway; "Practical Application of the System," G. J. Pearmain. Storey's Gate, 5.30 p.m.

MONDAY, DEC. 21

I.E.S. (Sheffield).—"3-D Cinema Films." A. Bowen, J. Moir, and A. P. Castellain. Surrey St. Library Theatre, 6.30 p.m.

TUESDAY, DEC. 22

INST. OF FUEL (London).—"Festival Hall Heat Pump." P. E. Montagnon and A. L. Ruckley. Inst. of Mechanical Engrs., Storey's Gate, S.W.1., 5.30 p.m.

EXHIBITION DIARY

Hotel, Restaurant and Catering.—Fourth exhibition to be held at Olympia, London, from Jan. 20 to 29.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London, W.C.2.

Bristol's Instrument Manufacturing Co., Ltd. Electrical and mechanical engineers, iron, brass and metal founders, etc. Cap.: £100. Dirs.: to be appointed by subs. Subs.: J. F. Wright, Inglewood, 10 Buxton Rd., Weymouth, Dorset; and D. C. H. Jenkins, 16-18 Mansfield St., W.1.

Sutton Automatic Control, Ltd., Mitre House, 13-15 High St., Sutton, Surrey. Importers and exporters of and dealers in automatic controls, electrical and other control gears, etc. Cap.: £100. Dirs.: S. J. Cooney and Dorothy M. Cooney.

Tape Recorders (Electronics) Ltd. Manufacturers of and dealers in tape recorders, recording machines, radio and electrical goods etc. Cap.: £2,000. Dirs. to be appointed by subs. Subs.: A. A. Morley and J. F. Glow, 14 Manchester Sq., W.1.

John Taylor (Liverpool) Ltd., 10 Strand St., Liverpool. Mechanical, marine, electrical and general engineers, etc. Cap.: £30,000. Dirs.: J. L. Taylor, senr., A. J. Hack and J. A. Ross.

Transformer Impregnating Co., Ltd., Central Hall Bldgs., South Rd., Southall. Impregnating of radio, television and electrical instruments and apparatus, etc. Cap.: £2,000. Dirs.: J. A. G. Gillespie and Margaret J. Gillespie.

Tropicaire Ltd., Ashford Rd., Ashford Common, Ashford, Middx. Manufacturers of and dealers in machinery, plant, apparatus, appliances, fittings, equipment and metal and plastic goods of every kind, including oil burning equipment and refrigerating and air-conditioning plant, etc. Cap.: £500. Dirs.: W. F. Bates, F. E. Phipps and V. J. Simpson.

Tucker and Pearce, Ltd., 94 Victoria Rd., Swindon. Electrical contractors, manufacturers of and dealers in electrical goods, etc. Cap.: £3,000. Dirs.: R. A. Pearce and Irene M. Pearce.

Valmade Ltd. Mechanical, electrical and general engineers, precision engineers, etc. Cap.: £100. Dirs. V. Valchera and Florence A. Valchera, 33a Kenilworth Rd., Ashford, Middx.

View Rentals (City), Ltd. Electrical and mechanical engineers, manufacturers of and dealers in television and wireless apparatus, etc. Cap.: £10,000. Dirs.: Peggy Hollamby and J. P. Hollamby, 36 Gerard Rd., Harrow, Middx.

Weatherheads (Woburn Sands) Ltd., 2 Aspley Hill, Woburn Sands, Bletchley. Manufacturers of and dealers in electrical and mechanical apparatus, and in particular wireless sets, etc. Cap.: £2,000. Dirs.: H. C. Weatherhead and Mrs. G. L. M. Weatherhead.

Wickham Industrial Equipment Ltd., Crane Mead, Ware, Herts. Civil, mechanical, electrical, hydraulic and steam engineers, machinery manufacturers, tool makers, brass founders, etc. Cap.: £2,000. Dirs.: W. J. Odell, E. G. Reed and J. E. Atkinson.

Willerby Units (Manchester) Ltd., 23 Trinity House Lane, Hull. General heating, ventilating, lighting, mechanical, electrical, radio, motor, marine, refrigerating, constructional and consulting engineers, etc. Cap.: £3,000. Dirs.: J. J. Richardson, W. Allan and J. Swallow.

Wynn (Valves) Ltd., Granville St., Birmingham. Manufacturers of and dealers in valves of all kinds, machinery and apparatus; engineers, electricians, etc. Cap.: £100. Dirs.: N. K. Mousley, H. H. Gwilliam, and E. W. Wynn.

Braun (Bletchley) Electronics Ltd., Balham Rd., N.9. Importers, manufacturers and distributors of electronic and photographic equipment, etc. Cap.: £100. Dirs.: H. J. Camp and P. F. Camp.

Braun (Bletchley) Domestics Ltd., Balham Rd., N.9. Importers, manufacturers and distributors of domestic equipment and apparatus, both electrical and otherwise, etc. Cap.: £100. Dirs.: H. J. Camp and Dorothy M. Randall.

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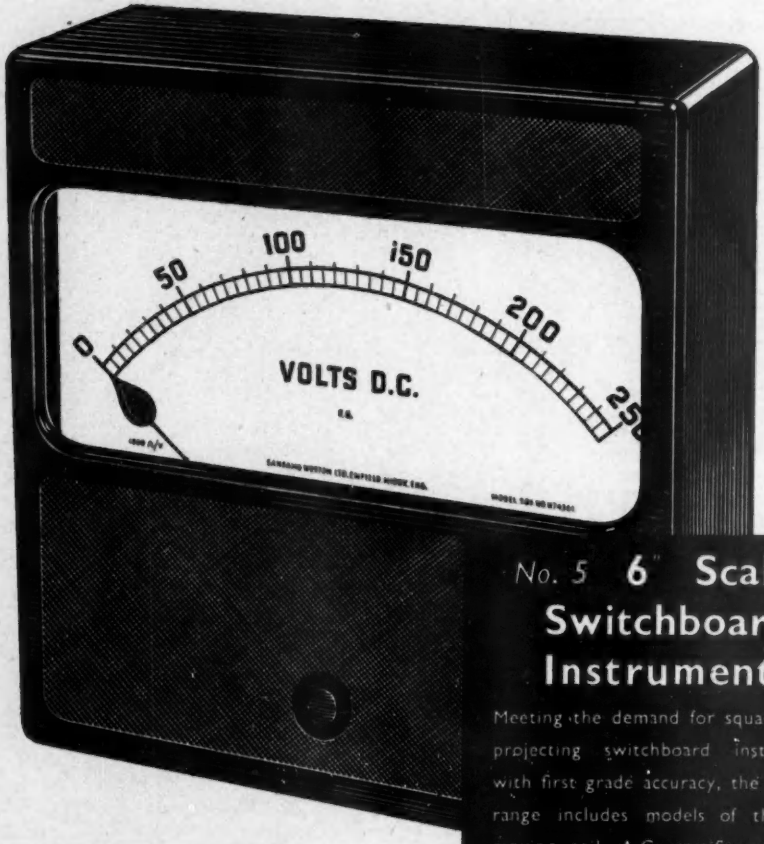
are only nine inches deep and just fit nicely into a garden wall like this one. The corner is clear —no awkward obstruction for pedestrians, yet the pillar is quite accessible.

Ask for Catalogue 22.

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1



No. 5 **6" Scale Switchboard Instruments**

Meeting the demand for square cased projecting switchboard instruments with first grade accuracy, the Weston range includes models of the D.C. moving coil, A.C. rectifier and H.F. thermocouple types, as well as the moving iron type. The model S.83 illustrated, is fitted with a 6" scale and pear shaped pointer for ease of reading. Send for details of Weston switchboard instruments. The full Weston range includes panel, switchboard, portable, sub-standard and laboratory standard instruments.

WESTON
Electrical Measuring Instruments

SANGAMO WESTON LIMITED

Enfield, Middlesex. Tel: Enfield 3434 (6 lines) & 1242 (4 lines). Grams: Sanwest, Enfield

London, Glasgow, Manchester, Newcastle-on-Tyne, Leeds, Liverpool, Wolverhampton, Nottingham, Bristol, Southampton, Brighton

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WORK WANTED WANTED · FOR SALE

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

SHIN-CAITHNESS TRANSMISSION
132 KV SWITCHGEAR FOR SHIN SUBSTATION

TENDERS are invited for 132 kV switchgear and ancillary equipment for Shin Substation.

Copies of the tender document may be obtained from the Engineers, Messrs. Kennedy and Donkin, 12 Caxton Street, London S.W.1, on receipt of a deposit of £2 2s. (returnable).

The Board do not bind themselves to accept the lowest or any tender.

W. D. D. FENTON,
Secretary.

16 Rothesay Terrace,
Edinburgh 3.
December 10, 1953. (G 171)

THE URBAN DISTRICT COUNCIL OF ABERDARE

PUBLIC LIGHTING

TENDERS are invited for the SUPPLY and ERECTION of public lighting equipment at (a) Hirwaun Road and (b) Victoria Square, Aberdare.

Forms of tender and schedule of requirements may be obtained from the office of the Engineer and Surveyor, Vestry Hall, Aberdare.

Tenders, with full details of the equipment offered, sealed in plain envelopes bearing no mark of the sender, but endorsed "Lighting—Hirwaun Road (or Victoria Square)", are to be delivered to me before 5 p.m. on Monday, January 11, 1954.

The Council does not bind itself to accept the lowest or any tender.

D. G. JAMES,
Clerk of the Council.

Town Hall, Aberdare,
December 8, 1953. (G 160)

BOROUGH OF HENDON

STREET LIGHTING EQUIPMENT
LANTERNS AND COLUMNS

THE BOROUGH COUNCIL invites tenders for:

(a) The supply, delivery and installation of lanterns for 140 watt sodium lamps, together with transformers, condensers and other ancillary equipment, including all necessary wiring, and
(b) The supply and delivery to site of reinforced concrete lamp standards, 25 feet to light source required in connection with the improved lighting of a section of the Watford Way (from the junction with Northway Circus to the junction with Mill Hill Circus).

The form of tender, specification and bills of quantities will be issued by, and plans Nos. 8092/1 and 2 may be inspected at the offices of the Borough Engineer and Surveyor.

Application for the documents must be made to the Borough Engineer and Surveyor not later than Tuesday, December 22, 1953, accompanied by a deposit of £2 2s. in each case which will be returned on receipt of a bona fide tender on the form provided, and not subsequently withdrawn.

In the case of the accepted tender the deposit will be returned on the execution, when required, of the contract and bond; failing such execution as aforesaid the deposit will be forfeited.

The documents will be forwarded to the applicants as soon as possible after December 22, 1953, and must be returned on or before Saturday, January 2, 1954, in the envelope provided (suitably endorsed), which shall not bear any name or mark indicating the sender. Tenders received after this date and time will not receive consideration.

The Corporation does not bind itself to accept the lowest or any tender.

LEONARD WORDEN,
Town Clerk.

Town Hall,
Hendon, N.W.4. (G 173)

SKELTON & BROTTON URBAN DISTRICT COUNCIL

TENDERS FOR ELECTRICAL WIRING, ETC.

THE Council invite tenders for the electrical wiring and installation of electrical fittings in respect of 16 houses on their Brotton Estate.

Plans may be inspected and specifications and form of tender obtained at the office of the Engineer and Surveyor, Council Offices, Skelton-in-Cleveland.

Tenders, enclosed in plain sealed envelopes endorsed "Electrical Installations, Brotton," must be delivered to the undersigned not later than noon on Wednesday, January 6, 1954.

The Council do not bind themselves to accept the lowest or any tender.

F. WILKINSON,
Clerk of the Council.

Council Offices,
Skelton-in-Cleveland. (G 172)

COUNTY BOROUGH OF CROYDON

PEDESTRIAN CROSSINGS

TENDERS are invited for the supply of flashing beacon equipment. Particulars from the Borough Engineer. Closing date for tenders December 31, 1953.

E. TABERRER,
Town Clerk.
(G 148)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

RADIO TECHNICIANS

REQUIRED as SIGNALS ASSISTANT INSPECTORS OF POLICE by the GOVERNMENT OF KENYA for one tour of two years, extending to three years by mutual consent and with possibility of permanency. Commencing salary etc. according to previous experience in scale £786 rising to £1,134 a year. Gratuity (at least £162 after two years' service) payable on satisfactory final completion of service. Outfit allowance £30. Uniform allowance £10 a year. Free passages. Liberal leave on full salary. Candidates, aged 20-35, should be at least 5 ft 7 in. without footwear, have normal vision without glasses and be of good education. They should possess a sound knowledge of the installation and maintenance of modern low and medium powered v.h.f., static and mobile equipment, h/f transmitters and receivers, petrol generators and diesel electric sets. Previous police experience not necessary.

Apply, in writing, to the Crown Agents, 4 Millbank, London S.W.1, stating age, name in block letters, whether married or single, full qualifications and experience and quote M1/35631/EE. (G 141)

CITY ARCHITECT'S DEPARTMENT, MANCHESTER

APPLICATIONS are invited for the following appointment on the permanent staff:

ELECTRICAL ENGINEERING ASSISTANT—Salary A.P.T. Grade III—£525 to £570 per annum.

Further particulars and forms of application may be obtained from the City Architect, Town Hall, Manchester 2. The completed form to be returned to the same address not later than December 31, 1953.

Canvassing is prohibited. (G 142)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions within the Division.

CIVIL ENGINEERING DRAUGHTSMEN

Construction Department. Vacancy No. 22/53.

Candidates should have experience in design and detail of reinforced concrete structures, piled and slab foundations for heavy plant, culverts, cable subways, etc., for general building construction drainage and sanitation schemes, associated with official and administrative buildings.

The salary will be in accordance with Grade 5 (£567 to £671 per annum) or Grade 6 (£433 to £567 per annum) of Schedule "D" of the National Joint Board Agreement.

ENGINEERING DRAUGHTSMEN (MECHANICAL)

Construction Department. Vacancy No. 44/53.

Senior Draughtsmen are required in the Mechanical Section of the Construction Department at North Wilford Power Station. Candidates should have experience in one or more of the following:—

(i) Design and layout of power station equipment, including turbo-alternators, boiler plant, coal and ash plant, and general station auxiliaries.
(ii) H.p. and l.p. steam and feed pipework. Condensing plant and feed heating systems.
(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Salary and conditions of service will be in accordance with the National Joint Board Agreement Grade 5 (£567 to £671 per annum) and Grade 6 (£433 to £567 per annum) of Schedule "D" according to experience.

ENGINEERING DRAUGHTSMEN (ELECTRICAL)

Construction Department. Vacancy No. 61/53.

Candidates should have experience in the preparation of layouts and diagrams for the installation of e.h.t. and l.t. switchgear, transformers, e.h.t. and l.t. cables; knowledge of protective gear systems would be an advantage.

The salary will be in accordance with Grade 5 (£567 to £671 per annum) or Grade 6 (£433 to £567 per annum) of Schedule "D" of the National Joint Board Agreement.

GENERAL ASSISTANT ENGINEER (CONSTRUCTION)

Northampton Power Station Site Extensions.

Vacancy No. 140/53.

Applicants should hold the Higher National Certificate in Electrical or Mechanical Engineering or be Graduate Members of the I.E.E. or I.Mech.E. and should preferably have had workshop training.

The successful applicant will be required to act as an assistant to the Site Engineer.

The salary will be in accordance with Schedule "C," Class "AX/DX." Grade 8 (£501 to £694) of the National Joint Agreement.

The closing date for this appointment will be December 30, 1953.

ASSISTANT SHIFT CHARGE ENGINEER

Avon Power Station. Vacancy No. 147/53.

Applicants should have had sound technical training and experience with modern generating plant and should preferably have the Higher National Certificate in Electrical and Mechanical Engineering.

The salary for this appointment will be in accordance with Class "E," Grade 9 (£567 to £800 per annum) of the National Joint Board Agreement.

The closing date for this appointment will be January 4, 1954.

STATION SHIFT CONTROL ENGINEER

Avon Power Station. Vacancy No. 143/53.

Applicants should have had sound technical training and experience in the control of modern switchgear.

The salary will be in accordance with Class "E," Grade 10 (£555 to £569 per annum) of the National Joint Board Agreement.

The closing date for this appointment will be December 30, 1953.

JUNIOR CHEMIST

Staythorpe Power Station. Vacancy No. 148/53.

Applicants must have had a sound technical training and some laboratory experience is desirable.

Preference will be given to candidates who hold the Higher National Certificate in Chemistry, but holders of the Ordinary National Certificate in Chemistry will be considered.

The salary will be in accordance with the National Joint Board Schedule within the salary range £402 to £541 per annum.

The closing date for this appointment is January 4, 1954.

MECHANICAL MAINTENANCE ENGINEER

Drakelow Power Station. Vacancy No. 149/53.

Applications from suitably qualified engineers are invited for the above position; candidates should have good administrative and organising ability, and have experience in all aspects of the maintenance of large

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(*Continued from previous column*)

capacity high-pressure turbo-alternators and pulverised fuel-fired boilers.

Apprenticeship at a large manufacturing works will be an advantage.

Salary Class "J," Grade 6, £893 to £918 per annum under the National Joint Board conditions of service.

The closing date for this appointment is January 4, 1954.

FIRST ASSISTANT CHEMIST

Burton-on-Trent Power Station. Vacancy No. 150/53.

Applicants should preferably possess the Higher National Certificate in Chemistry or its equivalent. They should have had practical experience in the analysis of coal, water and oil, etc., in so far as they concern power station requirements and will be directly responsible to the Group Chemist.

The salary for the above appointment will be as National Joint Board Schedule, Class "E," Grade 9, £587 to £800 per annum.

The closing date for this appointment will be January 4, 1954.

The above positions will be pensionable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned to the undersigned by the dates stated. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.
(G 166)

SOUTH EASTERN ELECTRICITY BOARD

FITTER (ELECTRICAL)

Eastbourne District.

WAGES: 3s. 8d. per hour for 44-hour five-day week under N.J.I.C. Agreement. Preference will be given to applicants who have had experience with h.v. and l.v. switchgear, transformers, etc.

Applications, giving two referees, must reach J. E. Winborne, Eastbourne Manager, SEEBoard, Electric House, Grove Road, Eastbourne, by December 31, 1953.

A. L. BURNELL,
Secretary.
(G 164)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule "A". Salary inclusive of London Allowance. Qualifications entitling to Corporate Membership of appropriate Institution for posts (a) and Graduate Membership for posts (b), an advantage.

(a) TURBINE HOUSE SUPERINTENDENT
Brunswick Wharf Generating Station.

Applicants must possess a good engineering background, with experience in the maintenance and operation of h.p. turbine plant and auxiliaries, and also be capable of planning and programming maintenance of the plant. Efficient operation and control of expenditure will be one of the responsibilities of the appointment. Salary: Class "K," Grade 6, £992 16s. pa..

(a) BOILER HOUSE SUPERINTENDENT
Brunswick Wharf Generating Station.

Applicants must possess good engineering background with experience in the maintenance and operation of h.p. boiler plant, pulverised fuel firing equipment and fuel handling gear. The duties will also include the planning and programming of the maintenance of the plant, together with the efficient operation and control of costs. Salary: Class "K", Grade 6, £982 16s. p.a.

(b) SHIFT CHARGE ENGINEER
Hammersmith Generating Station.

Applicants should have had practical experience of power station operation and maintenance. Salary: Class "D", Grade 7, £684 13s. p.a.

(a) OPERATION AND EFFICIENCY ENGINEER
Woolwich Generating Station.

Applicants should have had a comprehensive experience of modern power station operation. Salary: Class "G," Grade 5, £872 11s. p.a.

(b) JUNIOR ENGINEERS

(1) Barking "A" and "B" Generating Station.
(2) Barking "C" Generating Station.
(3) West Ham Generating Station.
(4) Blackwall Point Generating Station.

1, 2 and 3: Control Room Shift Duties (Assistance). 4: General Duties in Generating Station.

Salaries: 1: Class "M," Grade 17, £574 7s. p.a.; 2: Class "J," Grade 18/14, £427 to £572 5s. p.a.; 3: Class "H," Grade 14, £541 16s. p.a.; 4: Class "F," Grade 14, £491 p.a.

Application may be made on form obtainable from Divisional Secretary, B.E.A., London Division, Generation House, Great Portland Street, W.1, and be received within 14 days of this advertisement. (G 162)

YORKSHIRE ELECTRICITY BOARD

No. 2 (Huddersfield) Sub-Area

SENIOR ASSISTANT ENGINEER
(Construction)

APPLICANTS should be Corporate Members of the Institution of Electrical Engineers, or hold equivalent qualifications. They should preferably have wide experience in programming and supervising substation construction, underground and overhead system construction at all voltages up to 66kV, and be capable of taking administrative control under the Sub-Area Engineer for the Sub-Area Construction Section.
Salary: N.J.B., Class "K," Grade 4, £1,093 to £1,141 p.a.

THIRD ASSISTANT ENGINEER
(Rural Development)

Applicants should preferably be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications, and be well experienced in agricultural electrification. They must have a thorough knowledge of all farm electrical appliances and their operation. The successful candidate must be capable of putting a sales and service policy into active effect.
Salary: N.J.B., Class "K," Grade 10, £719 to £760 p.a.
Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market Street, Huddersfield, not later than December 31, 1953.

No. 1 (Bradford) Sub-Area

SECOND ASSISTANT ENGINEER
(Distribution Design)

The duties of this post will primarily be connected with rural development planning and estimating.
Candidates should be Corporate Members of the Institution of Electrical Engineers or hold acceptable equivalent qualifications. They should have substantial experience on the above-mentioned work and preferably also have a sound practical background of construction and maintenance of rural overhead systems.
Salary: N.J.B., Class "K," Grade 7, £869 to £907 p.a.

Bradford District

GENERAL ASSISTANT DISTRICT ENGINEER

Applicants should have passed the Graduateship Examination of the Institution of Electrical Engineers or hold equivalent technical qualifications; they should have experience in construction, operation and maintenance of high voltage systems, underground cables, overhead lines and substations, and medium and low voltage networks.
Candidates must be prepared to reside within the district and undertake standby duties, if required.
Salary: N.J.B., Class "H," Grade 11, £607 to £628 p.a.
Applications, giving full details of age, qualifications and experience together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53 Sunbridge Road, Bradford, not later than December 31, 1953.

No. 7 (Grimsby) Sub-Area

Sub-Area Headquarters.

THIRD ASSISTANT AND GENERAL ASSISTANT ENGINEERS are required in the Distribution Design, Construction and Operation and Maintenance Sections.
Candidates for Third Assistant Engineers should preferably be Corporate Members and for General Assistant Engineers, Graduate Members, of the Institution of Electrical Engineers, or have other equivalent qualifications.
Applicants should have the necessary degree of experience appropriate to each post, of h.v. and l.v. overhead and underground transmission and distribution systems.
Salary: Third Assistant Engineers, N.J.B. Class "G," Grade 10, £608 to £630 p.a.
General Assistant Engineers, N.J.B. Class "G," Grade 13, £496 to £514 p.a.
(It is anticipated that on April 1, 1954 the Sub-Area will be reclassified and the salary scale will then be £641 to £667 and £523 to £542 respectively.)

CLERK OF WORKS (TEMPORARY)

Candidates who should be suitably qualified persons must have a sound knowledge and experience of civil engineering and building works.
Salary: N.J.B. Class "G," Grade 10, £608 to £630 p.a.

Gainsborough District

GENERAL ASSISTANT DISTRICT ENGINEER

Qualifications as for General Assistant Engineer above, with experience in the construction and operation and maintenance of h.v. and l.v. overhead and underground distribution systems.
Salary: N.J.B. Class "D," Grade 11, £500 to £516 p.a.

Grimsby District

SENIOR SERVICE CENTRE ASSISTANT

Applicants should have had previous experience in service centre work, including the control of staff, sale of appliances, hire purchase agreements, handling of

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(Continued from previous column)

inquiries, and they must be capable of advising consumers on matters relating to the use of electricity.
Salary: N.J.C. Grade 3, £520 by £20 to £580 pa.,

JUNIOR ENGINEER

Applicants should have either the Higher National Certificate in Electrical Engineering or other equivalent qualifications and some experience in h.v. and l.v. overhead and underground distribution systems.
Salary: N.J.B. Class "F," Grade 15-14, £402 to £466 p.a.
Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than December 31, 1953. (G 165)

HER MAJESTY'S COLONIAL SERVICE

ENGINEERS

Posts and Telegraphs Department, Nigeria.

DUTIES include the supervision of African and European staff, installing and maintaining several types of wireless equipment, particularly v.h.f. single and multichannel.
Appointment is either pensionable on probation in the salary range £830 by £40 to £1,560 or on contract in the salary range £895 by £44 to £1,719 with a gratuity of £100 to £150 per annum on satisfactory completion of contract.
Free passages are provided for the officer, his wife, and an annual maintenance allowance or free passage allowance of £75 each is payable in respect of a maximum of two children. Leave is granted at the rate of seven days for each month of resident service. Government quarters are provided if available at a low rental.
Candidates, between 25 and 35 years of age (40 for G.P.O. candidates), must have passed or be exempt from Parts A and B of the examination for Associate Membership of the Institution of Electrical Engineers, or hold a university degree in electrical engineering, with telecommunications specialisation, or be assistant engineers in the British Post Office with considerable experience in telecommunication practice. Detailed experience of the installation and maintenance of v.h.f. single and multichannel wireless equipment and varied experience o modern telecommunication practice is necessary.
Apply in writing to the Director of Recruitment, Colonial Office, Great Smith Street, London S.W.1, giving briefly age, qualifications and experience. Mention the reference number C.D.E. 108/14/05. (G 144)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

Chief Engineer's Department,
Area Headquarters

APPLICATIONS are invited for the position of SECOND ASSISTANT ENGINEER in the Planning and Development Section. Salary in accordance with N.J.B. Agreement, Schedule "C," Class "AX/BX," Grade 2, commencing at a point within the range £834 to £970 per annum depending upon qualifications and experience. The appointment is superannuable.
Candidates should have a sound general and technical education, preferably with university degree and corporate membership of the I.E.E. The post necessitates experience in the design of 33 kV and lower voltage urban and rural distribution systems, and duties will include the carrying out of all necessary system calculations, together with the preparation of reports and estimates. Experience in the operation and maintenance of distribution systems, substation design and the application of modern protective gear technique is also desirable.
Applications, stating age, qualifications, experience and present position, should be addressed to the Chief Engineer, South East Scotland Electricity Board, 52 Melville Street, Edinburgh 3, not later than January 7, 1954.

J. WELLS,
Acting Secretary.
(G 145)

FOREMAN ELECTRICIAN

REQUIRED by the NIGERIAN GOVERNMENT RAILWAY for one tour of 12 to 24 months in the first instance. Commencing salary, etc., according to experience in scale £807 a year rising to £1,115 a year. Gratuity of up to £150 a year. Outfit allowance £60. Free passages for officer and wife. Assistance towards cost of children's passages or grant up to £150 annually for maintenance in U.K. Liberal leave on full salary. Candidates must have served an apprenticeship and have at least seven years' subsequent experience on electrical maintenance, including repairs to electric motors driving works machine tool equipment, overhead cranes and their control gear, and wiring systems where direct and alternating current in the power supply. They must also have a knowledge of the installation of diesel alternators and distribution equipment and of armature winding and repairs.
Write to the Crown Agents, 4 Millbank, London S.W.1, State age, name in block letters, full qualifications and experience and quote M2C/29666/EE. (G 161)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following vacancies:—

Board Headquarters, Wherstead, Ipswich.

THIRD ASSISTANT ENGINEER (COMMERCIAL) 81/53.N

Candidates should have had a sound technical training and wide experience in the commercial departments of supply undertakings, especially at consumer level. Additional knowledge and experience of street lighting, hire purchase trading and space and water heating would be a recommendation.

The salary will be in accordance with Grade 4 of Class "AX/DX" of Schedule C of the National Joint Board Salary Agreement, commencing at not less than £844.

Apply to The Chief Commercial Officer, Eastern Electricity Board, Wherstead, Ipswich, Suffolk.

Norfolk Sub-Area Headquarters, Duke Street, Norwich.

ENGINEERING DRAUGHTSMAN 82/53.R

Candidates should have had a sound training in engineering drawing office practice and preference will be given to applicants who have had experience in the design and layout of the installation of electrical switchgear, transformers and other equipment or work of a comparable nature.

The salary will be in accordance with Grade 6 of Schedule "D" of the National Joint Board Salary Agreement within a range of £433 to £567, commencing at a point appropriate to experience and qualifications.

Apply to The Manager, Norfolk Sub-Area, Eastern Electricity Board, 4 Duke Street, Norwich, Norfolk.

Future salary and conditions of service for both these appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications, by letter, stating age, education, qualifications and experience, with details of present appointment and salary should be submitted to the person concerned within 14 days of the appearance of this advertisement. (G 142)

BRITISH ELECTRICITY AUTHORITY

North Western Division

GENERAL ASSISTANT ENGINEERS required in Technical Department (Protection Section) at Cheadle, near Manchester (Vacancy No. 277/53), Barrow (Vacancy No. 278/53) and Carlisle (Vacancy No. 279/53). Applicants should possess H.N.C. (Elec.), be familiar with protective relays and protective schemes, and have good knowledge of indoor and outdoor switchgear. Duties include assisting in testing, commissioning, routine maintenance, and fault investigation of primary equipment and associated protective gear and control and indicating circuits. Area covered will be within a radius of 25 miles of Cheadle and 80 miles of Barrow and Carlisle. Salary £501 to £714 (AX/EX.8).

Apply, quoting Vacancy No. to Establishments Officer, British Electricity House, 625 Wilmslow Road, Manchester 20, before December 26. (G 150)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the post of:—

SHIFT CHARGE ENGINEER

Brimsdown "A" Generating Station.

Salary: Class "F," Grade 7, £697 to £718 per annum, plus London Weighting.

Applicants should have served an apprenticeship and obtained an Ordinary National Certificate in Electrical and/or Mechanical Engineering or equivalent. Experience in the operation of power station plant at high steam pressures will be an advantage.

Apply by December 31, 1953, giving age and details of qualifications and experience to the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14.

W. N. C. CLINCH,
Controller.
(G 163)

EASTERN ELECTRICITY BOARD

Essex Sub-Area

VACANCIES: ELECTRICIANS 80/53.R

Chelmsford District.

THERE are vacancies in the Chelmsford District of the Essex Sub-Area for Electricians at the Beehive Lane Depot, capable of carrying out all classes of electrical installation work.

The rate of pay, at present 3s. 6d. per hour for a 44-hour week, and conditions of service will be those laid down in the Agreement of the National Joint Industrial Council for the electricity supply industry.

Applications in writing, stating age, experience and present employment should be submitted to the District Manager, Chelmsford, Eastern Electricity Board, Anchor Street, Chelmsford, Essex, within 14 days of the appearance of this advertisement. (G 143)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 261/53—re-issue. STATION SHIFT CONTROL ENGINEER, Accrington Generating Station. Salary £531 to £547 (D.10).

Apply, quoting Vacancy No. to Establishments Officer, British Electricity House, 625 Wilmslow Road, Manchester 20, before December 26. (G 151)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

GENERAL ASSISTANT ENGINEER

Apparatus and Motor Section Sub-Area Headquarters, Birmingham and District Sub-Area

The duties involve the supervision of the Apparatus Section Workshops dealing with the overhaul and reconditioning of domestic, industrial and commercial electrical apparatus, including refrigerators, also the preparation of investigations and test reports on special apparatus and problems arising from the work of the Section. General engineering and workshop experience essential and technical qualifications desirable. Salary £692 per annum (N.J.B. Class "N," Grade 13). Apply, in writing, within 14 days, stating age, experience, present salary and position, to Sub-Area Manager, Midlands Electricity Board, 14 Dale End, Birmingham 4.

GENERAL ASSISTANT DISTRICT ENGINEER

Cheltenham District, Central Gloucestershire Sub-Area

Experience necessary in all branches of distribution work including the operation and maintenance of high and low voltage underground and overhead distribution systems. Technical qualifications desirable. Salary £524–£540 per annum (N.J.B. Class "E," Grade 11). Apply, in writing, within 14 days, stating age, experience, present salary and position, to Sub-Area Manager, Midlands Electricity Board, 126 London Road, Gloucester.

Shropshire and Herefordshire Sub-Area

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER

Leominster District

Applicants should have had a sound technical training with experience in the sale and installation of domestic and commercial equipment and associated wiring. The duties also include advising consumers in respect of new supplies, extensions and alterations on both rural and urban systems. Technical qualifications desirable. Salary £527 to £550 per annum (N.J.B. Class "B," Grade 8).

JUNIOR ENGINEER

Hereford District

Applicants should have had a sound technical training with practical experience in the sale and installation of domestic and commercial electrical equipment and associated wiring. Salary £390 per annum (N.J.B. Class "E," Grade 15).

Apply, in writing, within 14 days, stating age, experience, present salary and position, to Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

A. STEPHENS,
Secretary.
(G 178)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

SHIFT CHARGE ENGINEERS are required at (a) Stoke and (b) Stafford Generating Stations. N.J.B. service conditions, superannuable appointments, salaries within Schedule "A" of the Agreement, commencing at (a) £649 and (b) £559 per annum.

Applicants should have had experience in the operation and control of steam generating plant and main switchgear or mechanical and electrical experience at a manufacturer's works. Qualified marine engineers with electrical experience would be considered. Appropriate technical qualifications an advantage.

Apply on Forms AE6, quoting Vacancy Numbers (a) 560 MD and (b) 561 MD, available from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, by January 2, 1954. (G 175)

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the position of HEAD OF THE OPERATION AND MAINTENANCE SECTION of the Chief Engineer's Department at Carliol House, Newcastle-upon-Tyne.

Applicants must be appropriately qualified electrical engineers and have wide experience in the operation and maintenance of large distribution systems. The person appointed will be responsible to the Chief Engineer for co-ordinating operation and maintenance practice in the Board's Area. Provisional salary, subject to scales negotiated for N.J.M.H.E. Grade, £1,500 to £1,850 per annum, according to experience.

Applications stating age, qualifications and experience should be marked "Confidential" and forwarded to the Secretary (Establishments), The North Eastern Electricity Board, Carliol House, Newcastle-upon-Tyne, to arrive not later than January 2, 1954. (G 174)

SOUTHERN ELECTRICITY BOARD

DISTRICT ENGINEER

ALDERSHOT District of No. 3 (Portsmouth) Sub-Area. Salary, N.J.B. Class "F," Grade 3, Column 1 (£912 per annum). N.J.B. conditions of service.

Applicants should have had a wide experience of the planning, construction, maintenance and operation of h.v. and l.v. networks over a large urban and rural area. They should have had a full technical training and preference will be given to those possessing recognised qualifications in electrical engineering.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, in envelopes suitably endorsed, not later than January 16, 1954.

AGRICULTURAL ASSISTANT

On the staff of the Sub-Area Commercial Officer, Bournemouth. Salary, N.J.B. Class "K," Grade 10, Column 1 (£719 per annum). N.J.B. conditions of service.

Applicants should have had a wide experience in the application of electricity to agriculture and horticulture, possess a knowledge of agricultural machinery and rural electrification schemes, and be capable of giving talks to agricultural organisations.

Applications on forms obtainable from the Sub-Area Secretary, 1 Priory Road, Bournemouth, and returned to him, in envelopes suitably endorsed, not later than January 4, 1954.

ASSISTANT ENGINEER (PLANNING)

Aldershot District of No. 3 (Portsmouth) Sub-Area. Salary, N.J.B. Class "F," Grade 13 (£466 to £496 per annum). N.J.B. conditions of service.

The duties of the post will be to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground h.v. and l.v. networks, and will be required to undertake standby duties if required. The possession of suitable technical qualifications will be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, in envelopes suitably endorsed, not later than January 4, 1954.

The successful candidates for the above appointments will be required to contribute to the B.E.A. and Area Boards' superannuation scheme, if eligible. (G 183)

EASTERN ELECTRICITY BOARD

Suffolk Sub-Area

Vacancy for
JOINTER (E.H.T.)
Ipswich District 83/53R

APPLICATIONS are invited from suitably qualified persons for the position of Jointer (extra high tension) in the Ipswich District, operating from Ipswich.

Applicants should have had all-round experience in jointing and connecting all classes of cable including extra high tension.

The rate of pay, at present 3s. 6d. per hour, and the conditions of employment will be in accordance with the N.J.I.C. Agreement for the electricity supply industry.

Applications by letter, stating age, present position and experience should be submitted to the District Manager, Ipswich, Eastern Electricity Board, Electric House, Ipswich, Suffolk, within 14 days of the appearance of this advertisement. (G 182)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 100/53

APPLICATIONS invited for superannuable N.J.B. appointments:

(a) STATION SHIFT CONTROL ENGINEER, Llanelly Power Station.

Salary E. 10, £555-£569 per annum. H.N.C. and experience in a power station control room desirable.

(b) GENERAL ASSISTANT ENGINEER in the Technical Dept. Divisional H.Q.

Salary AX/CX 8, £501-£575 per annum. H.N.C. and/or Electrical Engineering Degree. Apprenticeship with large electrical manufacturers and experience in handling electrical problems in power station and transmission systems desirable.

Application forms obtainable from Divisional Secretary, South Wales Division, British Electricity Authority, Twyn-y-fedwen Road, Gabalfa, Cardiff, should be returned by December 31, 1953. (G 181)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, an ELECTRICAL FITTER in District 347 (Cardiff East) in the Central Sub-Area.

Wages and conditions in accordance with the N.J.I.C. Agreement, 3s. 8d. per hour, 44-hour week.

Applications, giving details of present employment and previous experience, should be addressed to the undersigned to arrive by December 28, 1953.

DISTRICT ENGINEER.

District 347,
Ninian Park Road, Cardiff. (G 185)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

Construction Department, Divisional Headquarters

THIRD ASSISTANT ENGINEER (MECHANICAL). The duties will include the drafting of specifications, the appraisal of and reporting on tenders on an efficient and economic basis, and special investigations relative to power station development.

A sound knowledge of mathematics and thermodynamics essential and experience in a power station and with one of the large power station plant manufacturers an advantage. Class "AX" Grade 5, £649-£790 per annum.

SENIOR DRAUGHTSMAN (MECHANICAL). Candidates should preferably possess Higher National Certificate and have had experience in the design and layout of power station equipment including turbo-alternators, boiler and ancillary plant, h.p. and l.p. steam and feed pipework. Schedule "D," Grade 5, £567-£671 per annum.

GENERAL ASSISTANT ENGINEER (ELECTRICAL). Applicants should preferably possess education qualifications equivalent to Higher National Certificate and should have had some experience in electrical engineering construction, technical analysis and the preparation of specifications. Class "AX," Grade 8, £501-£639 per annum. N.J.B. conditions of service; salaries quoted subject to an additional 5% London allowance. Applications, giving details of education, present position and experience should be received by the Establishments Officer, British Electricity House, Lower Ham Road, Kingston-on-Thames, by December 28. (G 179)

BRITISH ELECTRICITY AUTHORITY

TRANSMISSION DESIGN BRANCH, Headquarters, London, require:—

1. POWER CIRCUIT ENGINEER to co-ordinate the work of two small groups of engineers responsible for the design, specification and testing of overhead lines and cables. Candidates should have special experience with one of these types of equipment and some knowledge of the practice and principles associated with the other. Good personality and initiative to keep abreast of modern developments is of first importance. Provisional salary £1,525 inclusive.

2. OVERHEAD LINES ENGINEER to take charge of a small group of engineers responsible for the design, specification and testing of overhead line structures, conductors and fittings. Candidates should have extensive experience in all aspects of overhead line technology and practice, particularly the design, construction and testing of line structures for e.h.v. operation. Provisional salary £1,325 inclusive.

Candidates should preferably be Corporate Members of the I.E.E. Permanent salary scales are under negotiation and when agreed will be applied retrospectively to date of appointment.

Forms from D. Moffatt, Director of Establishments, British Electricity Authority, Winsley Street, London W.1, to be returned by January 11, 1954. Quote reference ET/434. (G 177)

BRITISH ELECTRICITY AUTHORITY

Yorkshire Division

APPLICATIONS are invited for the appointment of SENIOR ASSISTANT ENGINEER (CIVIL) in the Generation (Construction) Department, Commercial Street, Sheffield.

Salary, £970-£1,196 p.a., Grade 1, Class "AX/DX." N.J.B. agreement.

Candidates should preferably be Corporate Members of the I.C.E. and experienced in the design and construction of heavy foundations, river works, structures in reinforced concrete and steel and other civil engineering works associated with the design and construction of new power stations or extensions to existing stations.

Duties will include the preparation of specifications and bills of quantities, reports on tenders, examination of drawings, progressing of site works and general organisation and administration of a section of the Generation (Construction) Department.

Applications on Form AE8/ACT obtainable from the Divisional Secretary (Establishments), British Electricity House, St. Mary's Road, Leeds 7, should be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller. (G 180)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

ASSISTANT CHEMIST is required in the Divisional Laboratory at Birmingham. National Joint Board service conditions, superannuable appointment, salary within Schedule "C." Grade 8 of the agreement, commencing in range £501 to £639, ultimately rising to £694.

A sound general knowledge of analytical chemistry is required, and preferably industrial experience. The possession of a university degree or A.R.I.C. would be an advantage.

Apply on Form AE6, quoting Vacancy No. 362 MD, available from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, by January 9, 1954. (G 176)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEERS (POWER SALES)
Central District, Manchester; West District, Stretford, and North West District, Eccles

DUTIES will comprise routine power sales negotiations, surveys of consumers' premises, advice in connection with industrial power tariffs and all applications of electric lighting, power and heating in industrial premises.

Preference given to candidates who are Corporate Members of the Institution of Electrical Engineers, and who have had previous experience in industrial sales.

Salary scales: Central District, £607 to £621 p.a., Grade H.11; West District, £548 to £565 p.a., Grade F.11; North West District, £573 to £590 p.a., Grade G.11. N.J.B. conditions.

APPOINTMENT OF GENERAL ASSISTANT ENGINEER (TESTING ASSISTANT)
Sub Area Testing Station, Salford

Applicants should be experienced in testing meters, instruments (including standardisation), cables, protection equipment and substation plant, and should hold H.N.C. in electrical engineering or its equivalent. Experience in a manufacturer's works will be an advantage.

Salary scale: £661 to £681 p.a., Grade M.13, N.J.B. conditions.

Applications to Sub-Area Secretary, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by January 2, 1954. (G 184)

APPLICATIONS are invited by The General Electric Co., Ltd., to fill vacancies in their Fittings Design Office. Attractive salary and prospects for men with initiative. Initial applications should give as much information as possible of experience and qualifications. —Apply, in writing, to Staff Department, Magnet House, Kingsway, W.C.2. (G 192)

ASSISTANT ELECTRICAL ENGINEER required by Tin Dredging Companies in Malaya. Good general electrical knowledge of motors and electrical equipment and connecting up installations. Basic salary and cost-of-living allowance £840 to £1,050 per annum. Provident fund and pension scheme.—Write, giving details of training and experience, age, whether married or single to Box 174, Walter Skinner Ltd., 20 Copthall Avenue, London E.C.2. (G 146)

BRITISH ELECTRICITY AUTHORITY, Merseyside and North Wales Division, require GENERAL ASSISTANT ENGINEER (ELECTRICAL) in the Generation Construction Department, Divisional Headquarters, Woolton, Liverpool. Salary £501 to £639 per annum. Class "AX", Grade 8, Schedule 'C', N.J.B. Superannuable and subject to medical examination. Applicants should have the Higher National Certificate in Electrical Engineering, preferably be a Student or Graduate Member of the Institution of Electrical Engineers and should have experience in design and installation of electrical equipment in power stations. The successful applicant will be required to assist in the electrical work associated with the design and construction of power stations, including the preparation of specifications, checking tenders, handling contracts and supervision of work on site.—Application forms from the Divisional Secretary, Beaconsfield Road, Woolton, Liverpool. Closing date December 30, 1953. (G 152)

CABLE MANUFACTURER, non-ring, has opening for three REPRESENTATIVES, London, Eastern Counties and Scotland. Applicants must have sound connections for the sale of all types of rubber and plastic cables among electrical wholesalers, contractors, industrial users and collieries, etc. These are permanent appointments. Please reply, giving full details of connections and salary required, in strict confidence to Sales Director.—Box No. 3135, Electrical Times. (G 153)

DETAIL DRAUGHTSMAN with shop experience and design knowledge for work on light steel structures in London. 5-day week. Pension fund.—Apply in writing, stating age, experience, qualifications and salary required to the Staff Officer, British Insulated Callender's Construction Company Limited, 21 Bloomsbury Street, London W.C.1. (G 187)

DRAUGHTSMEN required for Plant Development. H.N.C. (Mech.) preferred and experience of power cable machines an advantage. Good pay with prospects for right men. Pension fund and bonus.—Apply to Staff Officer, B.I.C.C. Ltd., Belvedere, Kent. (G 154)

ELECTRICAL ENGINEER, A.M.I.E.E. or exempting examination. Aged 27/30 years, possessing a comprehensive knowledge of electrical installation work in all types of buildings, including factories, hospitals, schools, cinemas, etc., and fully conversant with the recognised wiring systems and all relevant regulations governing this type of work. Must possess knowledge of building construction and be capable of reading architects' and engineers' drawings. Able to prepare complete electrical specifications and illumination schemes. 5-day week. Pension fund.—Reply to Box No. 3145, Electrical Times, giving details of age, qualifications, experience and salary required. (G 188)

APPLICATIONS ARE INVITED

for the position of

SALES ENGINEER

in the areas of the North Western Electricity Board, Merseyside and North Wales Electricity Board, Yorkshire Electricity Board and South Wales Electricity Board.

These four vacancies, which arise from a degree of specialisation in the Creda Sales Organisation, call for experience in the selling of Domestic Electric Cookers and Water Heaters.

Applicants, who should be between the ages of 30 and 40, should submit full details, in writing, of experience, qualifications and salary required, to:

THE SECRETARY

SIMPLEX ELECTRIC COMPANY LIMITED

Blythe Bridge · near Stoke-on-Trent · Staffs.

(G 118p)

ELECTRICAL ENGINEER to be responsible for electrical and mechanical design of overhead line insulators. Training will be given as necessary. The post is superannuable and offers opportunities for promotion. Degree in electrical engineering is an essential qualification and a recognised apprenticeship with a large industrial manufacturer desirable. Age 23/30. Salary according to age, experience and qualifications.—Replies to the Chief Personnel Officer, Pilkington Brothers Limited, St. Helens, Lancashire. (G 155)

ELECTRICAL ENGINEER required for electrical department of works in the north-east. Should have a sound practical training, drawing office experience, a knowledge of motor control gear resistance calculations, and preferably some experience of electrical heating for industrial applications.—Apply, giving full details of experience, technical qualifications, age, whether married or single and salary required to Box No. 3139, Electrical Times. (G 157)

ENGINEER required by Mufulira Copper Mines, Ltd., Northern Rhodesia, to assist the electrical engineer in the technical administration of electrical system comprising turbo generators up to 30,000 kW total installed capacity, electric winders, electrolytic copper refinery, surface and underground reticulation, etc., and the power supply and distribution for a small town. Applicants should be under 32 years of age and should either hold a degree in electrical engineering or be a corporate member I.E.E. Good salary, plus cost-of-living allowance and substantial bonus. Also pension and life assurance scheme. Outward passage paid.—Write, in confidence, giving qualifications and experience, to Mine Employment Department, Selection Trust Building, Mason's Avenue, Coleman Street, London E.C.2. (G 186)

FERGUSON RADIO CORPORATION, LTD., offers exceptional opportunities to DRAUGHTSMEN wishing to make their career in the world of electronics, television and radio. Candidates preferably experienced in the radio and television industries, must have knowledge of mass production methods and workshop practice. Familiarity with Ministry requirements an advantage. Good salaries; pension scheme. Well-equipped drawing offices and good working conditions.—Apply: Employment Manager, Ferguson Radio Corporation, Ltd., Great Cambridge Road, Enfield, Middx. (G 131)

GRADUATE PHYSICIST or ELECTRICAL ENGINEER required by cable manufacturers in S.E. London. The successful candidate will be chiefly concerned with the research and development of high voltage polythene insulated power cables. Previous experience in this field desirable but not essential. Age 21 to 28. Must have completed National Service. Salary according to qualifications and experience. Five-day week, pension scheme and all welfare facilities.—Write details to Staff Officer, The Telegraph Construction and Maintenance Co., Ltd., Telcon Works, Greenwich, S.E.10. (G 167)

HANDLEY PAGE (READING) LTD., The Aerodrome, Woodley, Reading, have an immediate vacancy for a SENIOR AIRCRAFT ELECTRICAL DRAUGHTSMAN for work on an interesting new project. Only those who are fully experienced in all aspects of the work should apply, and for the successful applicant there will be suitable housing accommodation provided.—Please send full particulars of experience, etc., to the Personnel Officer. (G 28)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

JOINTER required for Middle East, experienced in jointing cables up to 11 kV.—Write, stating age, experience and give references or names to whom we may apply, to Box No. 3125, Electrical Times. (G 95)

LINESMAN wanted capable of taking charge, with experience of erection up to 11 kV on lines approximately three to five miles. Situated N.E. Scotland. First-class man only.—Box No. 3141, Electrical Times. (G 168)

PIRELLI-GENERAL CABLE WORKS, LTD., have Sales Department STAFF VACANCIES for general correspondence and preparation of Mains Cable Tenders.—Apply in writing to Sales Manager, Eastleigh Works. (G 115)

REQUIRED, live TECHNICAL REPRESENTATIVE for London and Home Counties, fully conversant with electrical wiring accessories, calling on architects, consultants, leading electrical contractors and wholesalers. Car owner essential. Compulsory pension and assurance scheme operative.—Reply, giving full details of present and past employments, salary expected, etc., to Box No. 3149, Electrical Times. (G 190)

REQUIRED, live TECHNICAL REPRESENTATIVE for the South Eastern territories, fully conversant with electrical wiring accessories, calling on architects, consultants, leading electrical contractors and wholesalers. Car owner essential. Compulsory pension and assurance scheme operative.—Reply, giving full details of present and past employments, salary expected, etc., to Box No. 3151, Electrical Times. (G 191)

RESPONSIBLE ELECTRICAL ENGINEER to take charge of plant and installations of electrical equipment, required by Tin Dredging Companies in Malaya. Must hold Board of Trade Electrical Certificate or be capable of obtaining 1st Grade Malayan Government Electrical Certificate. Basic salary of £980 per annum plus cost-of-living allowance of £490 per annum if married or £280 if single. Provident fund and pension scheme.—Write, giving full particulars of age and experience and copies of references, to Box 165, Walter Skinner Ltd., 20 Copthall Avenue, London E.C.2. (G 147)

ROTARY SWITCH SALES REPRESENTATIVE required by Santon, Ltd. in London. Applications are invited from gentlemen with a flair for salesmanship and experience with the design and control of complex circuits. Salary according to qualifications plus bonus and expenses. A car will be provided.—Written applications only please, in confidence, to Santon Ltd., East Acton Arcade, Old Oak Common Lane, Acton, W.3. (G 169)

SALES ENGINEERS required by progressive firm of electrical manufacturers for instrument sales in London and Manchester areas. Applicants should have knowledge of wide variety of electrical instruments and of commercial practices. Outside sales experience desirable but men otherwise qualified will be given training. General salary and full expenses paid. Pension scheme. —Reply to Box No. 3147, Electrical Times. (G 189)

SALES REPRESENTATIVE, Lancashire, for manufacturer of well-known electrical accessories. Electrical education, training and sales experience essential. Light and power installation knowledge advantageous. Prefer Lancastrian already domiciled central Lancs. Age 30-40. Medical exam. Car driver. Intensive work, long hours and results expected. Salary, commission, car expenses. Fully informative letter and photo confidentially considered.—Box No. 3109, Electrical Times. (G 43)

SAN SALVADOR (Central America). ASSISTANT DISTRIBUTION ENGINEER, age about 28, required by Canadian-owned public utility, 35,000 consumers. Permanent position with promotion dependent upon ability, opportunity and acquirement of Spanish. Salary U.S. $400 per month at exchange 2·5 to £1. Income tax 3%, no pension. Full particulars supplied to applicants giving concise details education and experience.—Apply, letter only (no telephone messages), to Mackness and Shipley, Consulting Engineers, Parliament Mansions, Abbey Orchard Street, London S.W.1. (G 193)

SENIOR SALES and CONTRACTS ENGINEERS are required by the English Electric Co., Ltd., Stafford, for heavy rotating electrical machinery and comprehensive schemes associated with this equipment.

Also JUNIOR ENGINEERS possessing H.N.C. and sound engineering experience, preferably with a commercial bias, are invited to apply.—Please write, giving full details, quoting Ref. 234C, to Dept. C.P.S., 336/7 Strand, W.C.2. (G 60)

DE HAVILLAND PROPELLERS LTD.

require

SENIOR DRAUGHTSMEN

10A Mechanical—for servo mechanism and high-speed turbine design.
10B For installation of aircraft auxiliary apparatus.
10C For modification design work.
10F Jig and tool.

INTERMEDIATE & JUNIOR DRAUGHTSMEN

10D Mechanical and electrical design—O.N.C.standard.
10F Jig and tool.

ELECTRICAL ENGINEERS

40 Both senior and junior—for work on light electro-mechanical devices.

CALCULATORS (MALE AND FEMALE)

11 For Weights Section, Stress Office. H.N.C. or equivalent qualification.

TECHNICAL SPECIFICATION WRITERS

Senior—good experience needed.
Junior—aeronautical background.

TECHNICAL EDITOR

12 Experience essential.

TECHNICAL ILLUSTRATOR

12A With ability to visualise and draw mechanical assemblies; preferably experienced in perspective line drawing.

ELECTRONIC ENGINEER

12 For ultimate position as Technical Editor in charge of section responsible for producing instructional literature.

INSTALLATION ENGINEER

19 For development work—interested in thermodynamics, test observing and preferably with some experience in air conditioning.

METALLOGRAPHER

53 For routine examination of mainly ferrous materials and works failures.

54 **ASSISTANT FOR X-RAY LABORATORY**

54B **ASSISTANT FOR METALLURGICAL LABORATORY**

ASSISTANT FOR ELECTRONIC LABORATORY

39 Interested in circuitry investigation.

ASSISTANT FOR ELECTRONIC LABORATORY

20 Junior—routine duties. Good opportunity for young man released from National Service.

WIREMEN

24 For interesting design and development work.

EXAMINER

27 With electrical knowledge.

INSPECTORS

42 Mechanical and electrical.

ESTIMATOR

26 Experience of aeronautical machine shop.

Write, preferably in tabulated form, and quoting reference number of position sought, to:

The Personnel Manager,

DE HAVILLAND PROPELLERS LTD.

Hatfield - Hertfordshire (G 90p)

SENIOR or JUNIOR DRAUGHTSMAN required for work on electrical power resistances and large electrical heaters for industrial applications. Previous experience on this class of work is desirable but not essential.—Apply, giving full details, including age, technical qualifications, whether married or single and salary required to Box No. 3137, Electrical Times. (G 156)

SHIFT CHARGE ENGINEER for Electricity Supply Undertaking in Baghdad. Applications are invited from suitably qualified engineers, preferably between 25 and 35 years of age, who have had experience in the operation of a power station of at least 15,000 kW, with medium pressure boilers. Salary £1,000 to £1,200 per annum, plus high cost of living allowance. Free house with heavy furniture will be supplied or a monthly house allowance of £12 in lieu.

Three-year contract, renewable, with first-class passage each way for successful applicant and family (if married). Three months' leave on full pay in U.K. on completion of 24 consecutive months in Iraq, first-class leave passages being paid.—Box No. 3127, Electrical Times. (G 103)

SOUTHDOWN MOTOR SERVICES, LTD., operating a fleet of 975 vehicles, invite applications for the post of ELECTRICAL SUPERINTENDENT. Necessary qualifications are knowledge of P.S.V. electrical equipment and workshop plant, and experience in planning, costing and executing electrical installations in new or existing buildings. Salary will be in accordance with experience and qualifications.—Applications with full details of training and experience should be addressed to the General Manager at 5 Steine Street, Brighton, and marked confidential. (G 158)

THE ENGLISH ELECTRIC CO., LTD., Stafford, have vacancies for DRAUGHTSMEN to work on a wide variety of heavy electrical machines, including the largest water and steam-driven alternators and mill motors. These are interesting positions offering prospects of advancement.—Write quoting Ref. 74D, to Dept. C.P.S., 336/7 Strand, W.C.2. (G 88)

THE SWITCHGEAR CONTRACTS DEPARTMENT of The English Electric Co., Ltd., Stafford, has vacancies for SENIOR ENGINEERS. Applicants should have recognised technical qualifications. A knowledge of modern switchgear and control gear practice, or of the protection and control of h.v. systems, transformers, and generators or large industrial machine drives, is desirable. Drawing office, test or operating experience will be considered an advantage. JUNIOR ENGINEERS with H.N.C. and engineering experience, preferably with a commercial bias, are also required.—Please write to Dept. C.P.S., 336/7 Strand, W.C.2, quoting Ref. 446R. (G 104)

TWO ELECTRICAL FOREMEN wanted to superintend cable laying and overhead distribution scheme at Benghazi, N. Africa. Single job lasting about 12 months.—Apply, with brief details of experience, to Box No. 3131, Electrical Times. (G 139)

APPOINTMENTS FILLED

BERMUDA ELECTRIC LIGHT COMPANY vacancy. All applicants are thanked, those on short list have been informed.

WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co. Ltd., Stanmore, Middx. (G 13)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service, 95 Park Lane, Leeds 1. (G 20)

FISHER FOUNDRIES LTD., Great, Birmingham, have immediate capacity for machine moulded PRECISION CASTINGS in gunmetal and grey iron ¼ to 30 lb. All castings shot blasted.—Telephone: Birmingham, Victoria 0197. (G 16)

WORK WANTED. Capacity available for all types of COIL WINDING.—Box No. 2425, Electrical Times. (G 17)

WANTED

A.C.-D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co. Ltd., 77 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (G 8)

WANTED, D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co. Ltd., 22-26 Britannia Walk, London N.1. (G 4)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady Street, Bethnal Green, E.1. (G 1)

WANTED. Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock water-tube boilers. Best prices paid. Prepared to purchase Babcock and Wilcox water-tube boilers for dismantling.—Apply, giving full details, to Midland Iron and Hardware Co., Cradley Heath, Staffs. (G 2)

WANTED. ROTARY CONVERTERS, any size.—Universal, 221 City Road, London E.C.1. (G 6)

WANTED, three-phase INDUCTION REGULATOR, alternatively Breco or Ferranti transformer type, rating 10 kVA or nearest.—Whitefield Machinery and Plant Ltd. Cobden Street, Salford 6. Tel.: Pen. 1373/4. (G 132)

FOR SALE

DOMESTIC APPLIANCES

80 reconditioned 11-gall. storage type WATER HEATERS, Creda and Hotric. Sample forwarded for inspection. Price £6 each.—Isle of Man Electricity Board, Harcroft, Douglas. (G 194)

LIGHTING EQUIPMENT

ABOUT 10,000 second-hand decorative COLOURED LAMPS, 230V, all usable. Inspection at Churchill Road Depot, Great Yarmouth, if desired. Offers or further particulars to Borough Engineer, Gt. Yarmouth. (G 195)

PURLEY CHOKES AND BALLASTS. Our 80-W tapped h.p.f. ballast with starter switchgear-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. E.T.), Purley, Surrey. Uplands 4818-9. (G 14)

METERS

A.C.-D.C. QUARTERLY and SLOT METERS.—Brent Electrical Co., 6 Holmdale Gardens, London N.W.4. (G 5)

DON'T worry about your electricity bills. Fit 1/- slot electric meters for hotels, bed-sitters, etc. Prices from 50/-.—Selectrics, Department E.T., Castle Circus House, Torquay. Tel. 7218. Trade inquiries invited. Trade discount. (G 21)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Road, London E.C.1. (G 10)

MOTORS & STARTERS

ELECTRIC MOTORS. 400/3/50, 300 h.p. auto synchronous L.D.M. MOTOR, open protected type on C.I. underbed, 600 r.p.m., with direct coupled exciter, and Brookhirst control equipment.

Two 260 h.p. slipring INDUCTION MOTORS by Mather and Platt, 587 r.p.m. pipe ventilated frames. Rotor volts 550/610. Rotor amps 215/195. Shaft 8 in. by 3¾ in. dia. including control gear.

175 h.p. external S.R. MOTOR by B.T.H., 480 r.p.m. Protected type, two endshield R.O.B., standard shaft ext.

Two 120 h.p. external S.R. MOTORS by Met-Vick, 585 r.p.m., screen protected type fitted drip-proof cowls. Endshield B.R.B. Standard shaft ext. 6 in. by 4 in. dia.

Three 95 h.p. Metro-Vick, SLIPRING, totally enclosed, fan-cooled type. Shaft ext. 6 in. by 3 in. dia. Continuously rated.

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(Continued on page 66)

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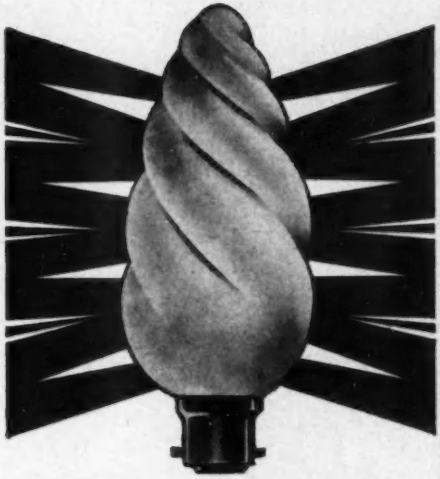

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INDEX TO ADVERTISERS

Aluminium Wire & Cable Co., Ltd. 25
Aron Electricity Meter, Ltd. ... 41
Ashdowns, Ltd. 76
Attwater & Sons 68

Bakelite, Ltd. 16
B.B. Chemical Co., Ltd. ... 78
Britannic Electric Cable & Cons. Co., Ltd. 22
British Die-Casting & Engineering Co., Ltd. 21
British Electric Lamps, Ltd. ... 65
British Electrical Repairs, Ltd. ... 49
British Insulated Callender's Cables, Ltd. 29
British Thomson-Houston Co. Ltd. 42, 86
Brook Motors, Ltd. 71
Brush Electrical Engineering Co., Ltd. 19
Burco, Ltd. 82

Cable Makers' Association ... 33
Cayson Electrics, Ltd. 68
Chamberlain & Hookham, Ltd. 43
Channel Conduits, Ltd. 18
Chloride Batteries, Ltd. ... 5
Cole, E. K., Ltd. 65
Cox Walkers, Ltd. ... 80
Cressall Manufacturing Co., Ltd. 4
Crompton Parkinson, Ltd. ... 20

Dussek Bros. & Co., Ltd. ... 50

East London Mica Works ... 12
Ekco-Ensign Electric, Ltd. ... 79
Engel & Gibbs, Ltd. 68
English Electric Co., Ltd. 1, 69
Erskine, Heap & Co., Ltd. ... 24

Ferranti, Ltd. 38
Fibreglass, Ltd. 37
Follsain-Wycliffe Foundries, Ltd. 8

General Cable Manufacturing Co., Ltd. 83
General Electric Co., Ltd. 40, 54
Green, E., & Son, Ltd. 26
Grelco, Ltd. 82

Harboro' Rubber Co., Ltd. ... 80
Heatrae, Ltd. 17
Heayberd, F. C., & Co., Ltd. ... 70
Henley's, W.T. Telegraph Works Co., Ltd. 55
Heyes & Co., Ltd. 39
Higgs Motors, Ltd. 10

Johnson & Phillips, Ltd. ... 45, 81

Kaye, E. & E., Ltd. 51
Kempston Electrical Co., Ltd. ... 82

London Electric Wire Co. and Smiths, Ltd. 46

Martindale Electric Co., Ltd. ... 18
Measurement, Ltd. 44
Metropolitan-Vickers Electrical Ltd. 47
Midland Electric Manufacturing Co., Ltd. 15
Midland Silicones, Ltd. 48

Nalder Bros. & Thompson, Ltd. 7
New Switchgear Construction Co., Ltd. 76
Newton Bros. (Derby), Ltd. ... 72
Nife Batteries, Ltd. 13

Parmiter Hope & Sugden, Ltd. ... 85
Partridge Jones & John Paton, Ltd. 35
Partridge Wilson & Co., Ltd. ... 77
Pilkington Bros., Ltd. 32
Plasticable, Ltd. 78
Premier Electric Heaters, Ltd. ... 67

R.C. Radio-Electric, Ltd. ... 78
Resistances, Ltd. 78
Revo Electric Co., Ltd. 31
Reyrolle, A., & Co., Ltd. 9
Rheostatic Co., Ltd. 23
Rowlands Electrical Accessories, Ltd. 73

Sanders, Wm., & Co. (Wednesbury), Ltd. 72
Sangamo Weston, Ltd. 56
Saxonia Electrical Wire Co., Ltd. 80
Scemco, Ltd. 74
Siemens Electric Lamps & Supplies, Ltd. 11
Simon-Carves, Ltd. 84
Simplex Electric Co., Ltd. ... 2
Smart & Brown (Engineers), Ltd. 70
Smith Meters, Ltd. 52
Smith, W. H., & Son, Ltd. ... 12
Statter, J. G., & Co., Ltd. ... 27
Steatite & Porcelain Products, Ltd. 28
Stewarts & Lloyds, Ltd. ... 3
Sturdy Electric Co., Ltd. 4
Sunvic Controls, Ltd. 34

Thorpe, F. W., Ltd. 4
T.M.C.-Harwell (Sales), Ltd. ... 30
Turner Bros. Asbestos Co., Ltd. 14

V.G. Porcelain Co., Ltd. ... 72
Volex Electrical Products, Ltd. ... 6

Washers, Ltd. 80
Weir Electrical Instrument Co., Ltd. 82
Westinghouse Brake & Signal Co., Ltd. 75
Wootton & Co., Ltd. 74

Yorkshire Switchgear & Engineering Co., Ltd. 36

(Continued from page 64)

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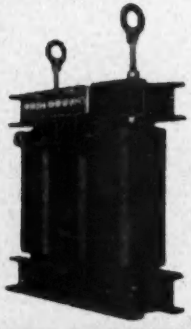

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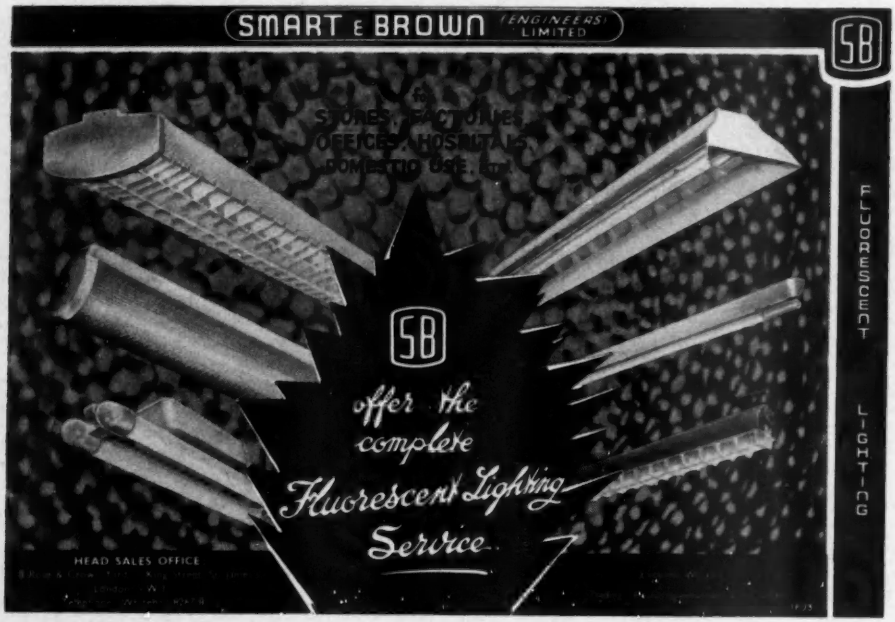

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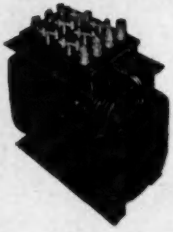
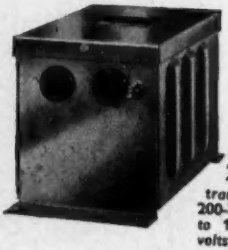


A typical open type 3-phase transformer.



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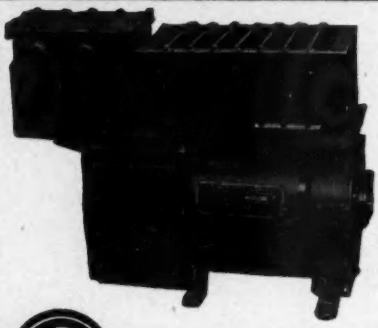

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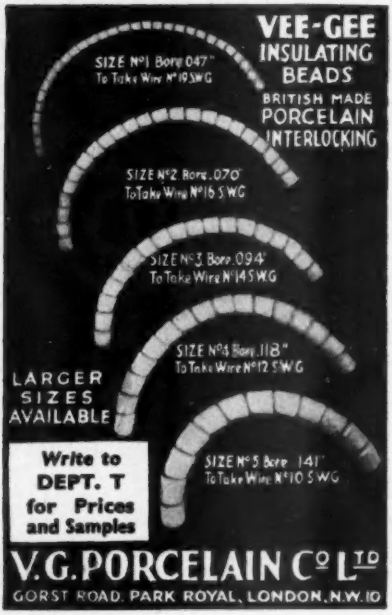
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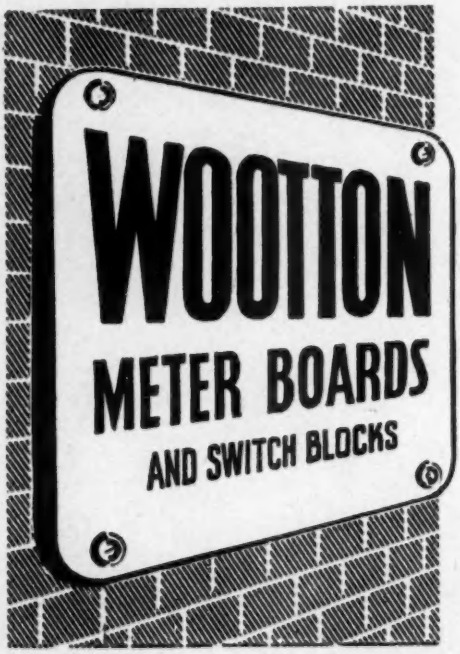

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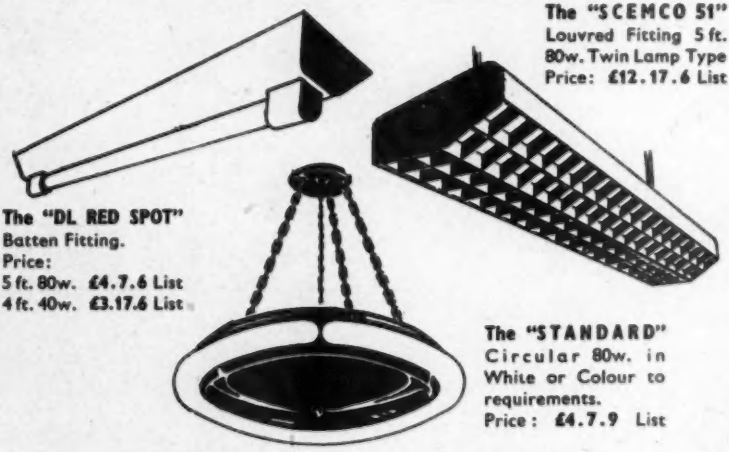

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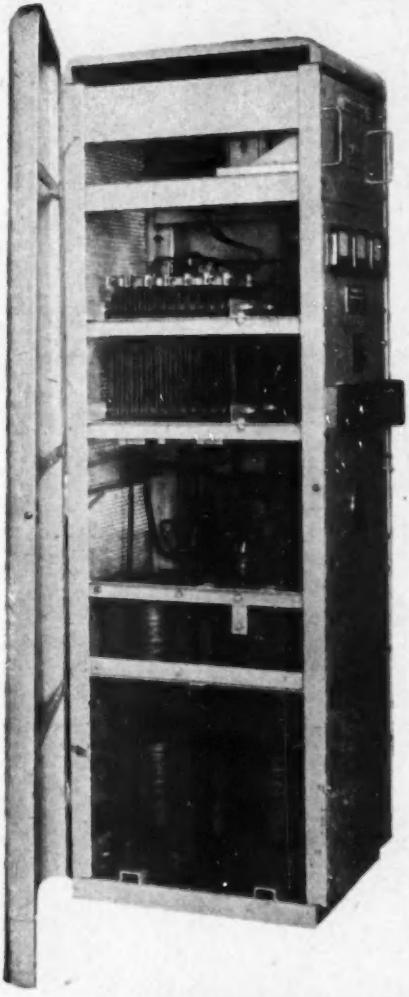

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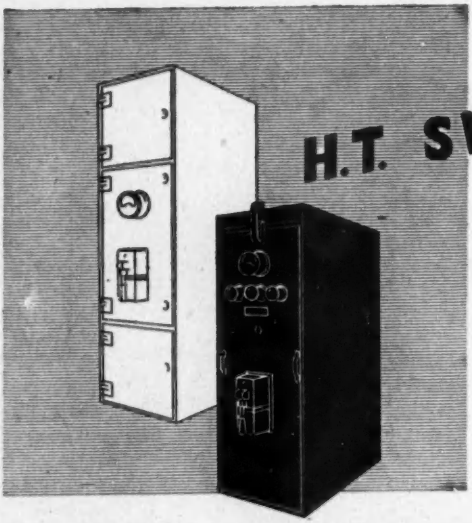

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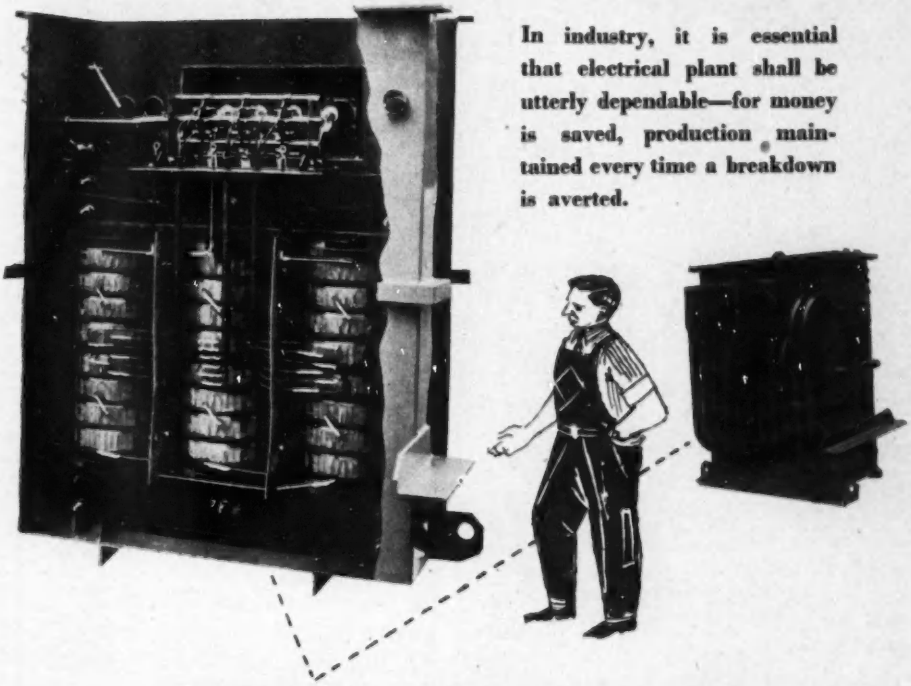

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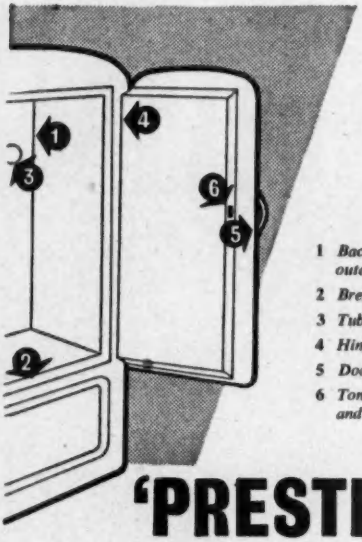

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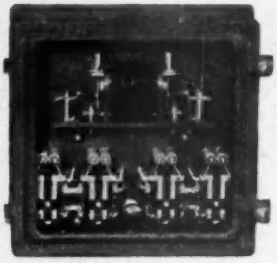

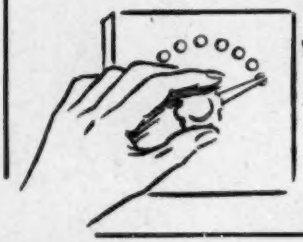

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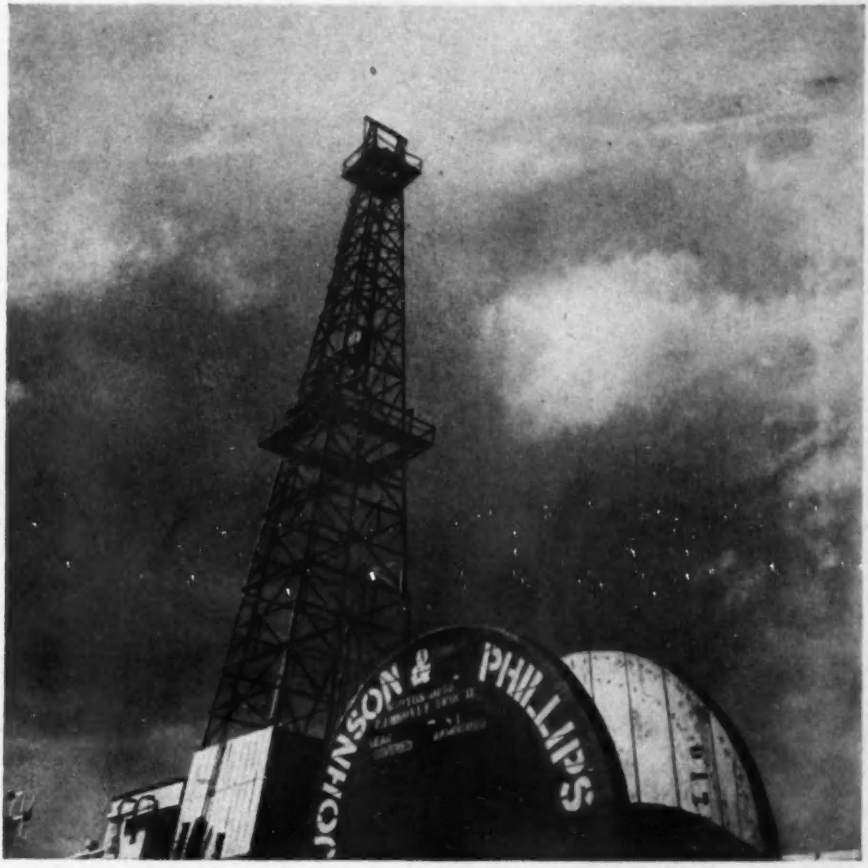

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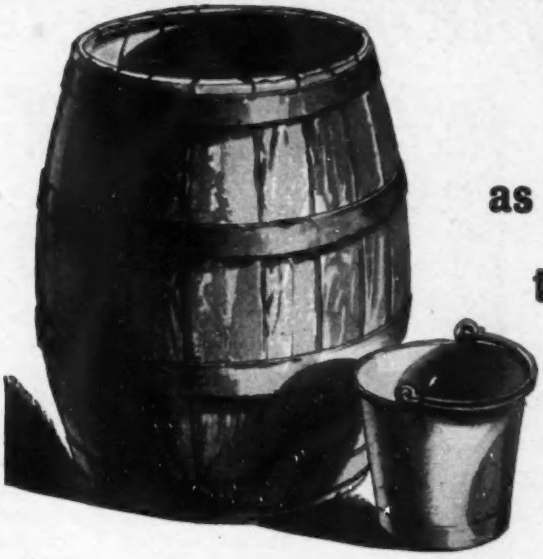

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